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Unveiling the Micro-Dynamics of Sustained Growth in Chile.

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OF SUSTAINED GROWTH IN CHILE**

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June, 2003

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1. Introduction

Chile registered remarkable economic growth between 1985 and 1998, when the country's growth rate was in the top four worldwide. In fact, the growth rate in per capita GDP was, by far, the highest in the world. As a result of sustained high growth, unemployment declined, wages rose, and poverty diminished markedly (World Bank, 2002). Policies targeted at low-income groups were also instrumental in bringing down poverty from 38.0% of the population in 1987 to less than 17% in 1998. Extreme poverty declined from 13% to around 4% in the same period.

Chile's outstanding macroeconomic performance in the late 1980s and 1990s has been portrayed as an example of successful market-oriented policies. As such, it has been the subject of numerous studies that tried to identify and quantify the determinants of Chile's growth.¹ Although the majority of the studies agree that external conditions –such as favorable terms of trade and greater availability of foreign capital– contributed to the economy's improved growth performance, they also highlight the beneficial impact of the market-friendly reforms implemented in Chile since the mid-1970s. They argue that these reforms explain the remarkable increase in total factor productivity (TFP) and that they prepared Chile to make the best of the international conditions it faced. Table 1 presents the decomposition of growth determinants for the Chilean economy, following the methodology of Kehoe and Prescott (2002)². It can be seen that the “golden” period of economic growth, 1984-1998, is largely the result of a remarkable expansion in TFP.

¹ See Loayza and Soto (2002) and the papers therein for the most up to date revision of Chile's economic growth and its determinants.

² Kehoe and Prescott (2002) decompose measured growth in per-worker GDP as:

$$\Delta \log\left(\frac{GDP_t}{N_t}\right) = \frac{\alpha}{1-\alpha} \Delta \log\left(\frac{K_t}{GDP_t}\right) + \Delta \log\left(\frac{L_t}{N_t}\right) + \Delta TFP_t$$

where N is the labor force, K is the capital stock, L is the employment and α is the share of capital in GDP.

Table 1
Growth Accounting in Chile

Period	Change in income per worker	Contribution of capital/output ratio	Contribution of employment/labor force ratio	Contribution of total factor productivity
1981-1983	-10.93	5.26	-8.38	-7.81
1984-1998	4.85	-0.37	1.73	3.49
1999-2001	0.85	1.57	-2.79	2.07

Source: Bergoeing and Morandé (2002).

The link between economic reforms and sustained growth at the macroeconomic level has been studied in a series of papers (see Loayza and Gallego (2002) for a survey and enlightened presentation). Reforms relied on liberalizing markets and allowing relative prices to be determined by market conditions (e.g., trade reforms, financial markets deregulation, elimination of subsidies and specific industry taxes, labor reform), confining government intervention to the control of externalities and market failures. Market competition and adequate returns to investment provided the incentives to explore and develop new markets (e.g., wines, fruit exports, tourism), as well as to increase the efficiency and profitability of traditional products (e.g., copper, wood pulp, fishmeal).

The outstanding response of the economy to reforms at the macroeconomic level reflects, naturally, substantial changes in the industrial organization of domestic markets, as well as the process of adaptation of individual firms to a new and more dynamic market environment. The underlying mechanics of technology adoption and changes in the management of firms have not been explored systematically until recently³.

This paper surveys the main studies on this field and provide new evidence on the interaction of firms and sectors with its macroeconomic environment. We do not pursue a detailed analysis of firm behavior, but rather concentrate on drawing lessons and policy conclusions from the observed dynamics of different sectors and types of markets (tradables vs. non tradables, small vs. big firms, new vs. old firms, protected vs. unprotected sectors). Nevertheless, in order to expose and articulate

³ See, among others, Navarro and Soto (2002), Bergoeing et al. (2003a and 2003b) and ; Alvarez and Fuentes (2003).

the different branches of current research and provide new evidence regarding Chile's growth process, we develop and use a simple analytical model to discuss the role of policies and reforms in affecting the decision of entrepreneurs to enter or leave a market and to adopt new, more efficient technologies. Section 2 of the paper presents a stylized version of our model.

Existing studies provide a wealth of information about the ability of the Chilean firms to incorporate technology, adapt to new market conditions, expand their production and exports, improve efficiency and increase the demand for labor, capital and intermediate factors. Likewise, they allow us to identify the limitations they face in terms of access to financial markets, access to technology, the quality of labor force, and the regulations imposed by the government, both in general terms and specific to industries or types of firms.

Economic reforms in the 1980s and 1990s, as expected, affected industries and firms differently. Changes in relative prices and deregulation had differential impacts on the different sectors and, consequently, production and productivity levels responded quite differently. Navarro and Soto (2001) decompose changes in productivity levels in the manufacturing sector into four components: the change in labor effort and capital utilization, the relocation of inputs from less efficient to more efficient firms, the change in the use of inputs in sectors with different markups, and technical change. The results, presented in Table 2, provide a richer perspective on economic growth in Chile. It can be seen that the high growth rate of productivity levels during and after the reforms (5.1% per year) was determined by different factors in two identifiable periods. During the 1979-1985 period –when most reforms were implemented– technical changes contributed less than 20% to the observed growth in productivity levels; most of the increases in efficiency came from the relocation of inputs from less efficient towards to more efficient firms and industries (75%). In the following 12 years (1986-1997) –a period in which the economy reaped the benefits of those reforms–, changes in productivity levels came largely from the adoption of new, more efficient technologies (66%), while the relocation of resources between firms and industries played a minor role (11%). In this latter period the exploitation of scale economies and markups becomes also important, contributing with 21% of the observed change in TFP.

This evidence suggests the importance of studying the behavior of the economic agents at the plant level, in order to understand how changes in macroeconomic conditions led entrepreneurs to adjust to new economic conditions and how they affected economic growth. Section 3 of the

paper presents the evidence on entry and exit of firms and their determinants, as well as an account of productivity changes at the firm and industry levels.

Table 2
Decomposition of the growth in productivity in the manufacturing sector
(average annual growth rates)

	Changes in observed productivity levels	Changes in markups	Changes in labor effort and capital utilization	Technical change	Relocation of inputs among firms and sectors
<i>1979-1997</i>					
Average	5.1%	0.8%	0.0%	2.5%	1.8%
Standard deviation	0.219	0.008	0.002	0.191	0.087
<i>1979-1985</i>					
Average	4.8%	0.3%	0.0%	0.8%	3.7%
Standard deviation	0.525	0.015	0.002	0.385	0.089
<i>1986-1997</i>					
Average	5.3%	1.1%	0.0%	3.5%	0.6%
Standard deviation	0.040	0.004	0.002	0.078	0.086

Source: Navarro and Soto (2001).

Sections 4 and 5 of the paper summarize the available evidence on the links between changes in productivity at the plant level and the two most important reforms for plant dynamics: first, the deregulation and deepening of the financial sector and, second, the liberalization of domestic and, especially, foreign trade. From these sections we derive several lessons about the response of firms to changes in macroeconomic conditions and, more importantly, we collect insights on the need for further reforms that would enhance the performance of the Chilean firms. Several other reforms were undertaken during the last twenty years in Chile. Two of them have been largely discussed: a labor reform and a new bankruptcy law. These reforms, although relevant in terms of their effect on plant dynamics and their aggregate implications, do not affect our analysis since they were

implemented either at the beginning (bankruptcy law in 1980) or at the end of the period under analysis (labor reform in 2001)⁴.

2. An analytical model of firm entry, exit, and productivity levels

We develop a dynamic general equilibrium model of heterogeneous plants to study the effect of macroeconomic reforms on the link between input reallocation, plant dynamics and growth, and in particular on the reshuffling of resources from less to more productive firms.⁵ We allow for aggregate and idiosyncratic shocks and policy changes. Policies –and rigidities in general– that affect current or expected productivity levels, interfere with the natural rates of birth, growth, and death of firms, reduce aggregate efficiency and productivity gains and, eventually, lead to stagnating investment and employment. For example, a production subsidy allows inefficient plants, that would have otherwise exited the market, to stay longer in business with adverse growth and development effects. As the inefficient allocation of resources pushes the economy inside its production possibility frontier and as the adoption of new and better technologies is delayed, the economy's balanced growth path of income per capita will lag with respect to the world's leading edge. Within this context, slow recoveries, recently observed in both rich and poor countries, and income per capita differences across countries, can be better understood.⁶

The model is also consistent with several aspects of input and plant dynamics that are present in the Chilean data (as described in Section 3) and cannot be captured by the standard neoclassical growth model (which assumes a representative firm and aggregate shocks exclusively). There is substantial evidence of heterogeneity in the dynamics and responses to shocks at the plant level. Economies undergo a continuous process of creation and destruction of jobs: in response to economic changes, existing plants expand or contract, new plants start up, and old plants shut down.

⁴For a description of both reforms see Beyer and Vergara (2001) and Larraín and Vergara (2000).

⁵ We extend the model in Bergoeing et al. (2003a).

⁶ Recent studies have suggested this connection between policy and recovery. Specific examples are Hayashi and Prescott (2002) for Japan during the 90s, Cole and Ohanian (2000) for the United States during the 30s, and Bergoeing et al. (2002b) for Mexico and Chile during the 80s and 90s.

Heterogeneity turns out to be important over time, across industries, and even among plants within the same sector and year. Within this setting, idiosyncratic shocks and policies emerge as potential sources of the observed heterogeneity.

Thus, the basic setup is extended to consider two type of distortions as sources of the heterogeneous behavior: policy shocks and rigidities in key markets (e.g., labor and credit markets). The model provides testable implications for the dynamics of accumulation, the role of rigidities and policies, the decision to enter/leave markets, and the level and evolution of aggregate productivity.

2.1 *The structure of the model*

Our model is based on those developed by Hopenhayn (1992) and Campbell (1998).⁷ We assume there exists a distribution of plants characterized by different levels of productivity. Plants face three types of shocks: a standard aggregate shock common to all establishments, an idiosyncratic shock to productivity, and a shock to the leading-edge production process. The latter corresponds to the best available technology for each production process.

In each period, plant managers decide whether to exit the market or stay in business. If a plant stays, the manager decides how much labor to hire. If the plant exits, owners recover a sell-off value. New technologies are developed exogenously every period and are readily available. In this context, an ongoing process of firms' entry and exit, and job creation and destruction characterizes the economy. Plants may decide to exit in order to gain access to the leading edge technology—Schumpeter's process of creative destruction—, although at the cost of receiving a scrap value for its capital. Investment irreversibility together with idiosyncratic uncertainty, generate an equilibrium with plants rationally delaying exit decisions. Also, plants may decide to exit permanently if the economic prospects loom negative.

Our model extends Campbell's (1998) analysis in three dimensions. First, by fully characterizing the dynamics at the plant level, we consider plant startups and shutdowns, as well as those which continue to operate (incumbents). This allows us to look not only at the entry and exit decision, but also at labor creation and destruction rates generated by continuing plants.

⁷ The macro literature that stresses the role of heterogeneous firms was pioneered by Jovanovic (1982).

Second, we consider not only idiosyncratic but also aggregate productivity shocks. In this setting, firms can become more productive over time for two reasons: because they are exposed to better methods of production or because they thrive while others disappear. We follow Levinsohn and Petrin (1999) in referring to these cases as the *real productivity* case and the *rationalization* case, respectively. The implications of these non-mutually exclusive methods of increasing aggregate productivity are very different and, potentially very important for the Chilean economy after the reforms were undertaken. While real productivity changes are unbounded and do not entail substantial worker displacement, the rationalization case is bounded by the production possibility frontier and involves significant reallocation of inputs across firms. Moreover, while the former predicts a negative correlation between entry and exit of plants (and also between labor creation and destruction rates), the latter suggests both correlations should be positive. Data for Chile using the Encuesta Nacional Industrial Anual (ENIA)⁸ show that the correlation between labor creation and destruction was -0.70 for the 80s. During the 1990-97 period, however, this correlation raised to -0.22 , eventually reflecting the increasing relative importance of idiosyncratic shocks during the last decade.

Third, as discussed below, we extend Campbell's model to allow for government policies. In particular, policy distortions such as capital cost taxes and labor-hiring subsidies. Analyzing government policies is essential to understand the Chilean case because in the last 25 years the country undertook substantial reforms in key dimensions of its economic structure. As mentioned earlier, market liberalization was far reaching, including trade liberalization, opening of financial markets to external competition, domestic market deregulation, and removal of labor markets restrictions. These reforms hit directly on the incentives of firms to stay or exit the market and, consequently, lead effects on aggregate productivity levels.

Finally, a few caveats on the restrictions imposed by our modeling assumptions. First, in our model, only new plants can incorporate the leading edge technology. Thus, innovation occurs only if entry occurs. In reality, however, technology adoption is a process in which incumbents are also engaged. Second, on average, plants expect a productivity level determined by their vintage. If shocks are zero, a plant will keep its productivity level constant over time. The evidence presented

⁸ See appendix for a description of the available databases.

in the following section, however, shows that older plants are more productive than younger plants. As a matter of fact, the evidence is consistent with learning by doing. Finally, in our model the only cost of closing a plant is given by the irreversibility in capital. In practice there several other elements that determine the cost of closing a plant.

2.2 *The Mechanics of the Model*

The economy is populated by a continuum of heterogeneous plants. Each plant needs labor (n) and capital (k) for the production of a unique good, which can be used for consumption or investment. Each plant utilizes a technology given by $y_t = e^{\lambda_t} n_t^\alpha (e^{v_t} k_t)^{1-\alpha}$, where v_t is an idiosyncratic productivity shock and λ_t is an aggregate productivity shock common to all establishments. The aggregate productivity shock follows an AR(1) process described by

$$\lambda_{t+1} = \rho^\lambda \lambda_t + \epsilon_{t+1}^\lambda, \quad \epsilon_t^\lambda \sim N(0, \sigma_\lambda^2).$$

Each type of capital embodies different levels of technology. Since technologies are characterized by constant returns to scale, we can normalize the size of all plants to be equal to one. Capital goods are identified with plants; i.e., investing one unit of an aggregate good yields a unit mass of plants. Capital embodying relatively low level of technology is scrapped as its productivity lags behind that of the leading edge technology. When a plant is retired, a unit of capital that is scrapped has salvage value $s < 1$. The total amount of salvaged capital in period t is then

$$S_t = (1 - \delta) s \int_{-\infty}^{\bar{v}} k_t(v_t) dv_t$$

where \bar{v} is the endogenously determined cut-off level of productivity that determines the exit decision of plants. Scrapped capital and investment are used to create new capital, which incorporates the leading edge technology.

The initial productivity level of a plant born in period t is a random variable with a Normal distribution $v_t \sim N(z_t, \sigma_v^2)$, where z_t is an index of embodied technology and represents the leading

edge production process. It follows a random walk with a positive drift μ , according to $z_{t+1} = \mu + z_t + \epsilon_{t+1}^z$, $\epsilon_t^z \sim N(0, \sigma_z^2)$. Capital that is not scrapped receives an idiosyncratic shock to

its productivity level before next period according to $v_{t+1} = v_t + \epsilon_{t+1}^v$, $\epsilon_t^v \sim N(0, \sigma_v^2)$.

The aggregate production function of this model economy is:

$$y_t = e^{\lambda_t} n_t^\alpha \left[\int_{-\infty}^{\infty} e^{v_t} k_t(v_t) dv_t \right]^{1-\alpha} = e^{\lambda_t} n_t^\alpha \bar{k}_t^{1-\alpha}$$

where $\bar{k}_t = \int_{-\infty}^{\infty} e^{v_t} k_t(v_t) dv_t$ is the effective capital stock. Finally, government expenditures (g_t) and

subsidies (or taxes) (τ_t) follow a autoregressive processes as the one described for the aggregate productivity shock, λ_t . Constant returns to scale ensure that profits are zero in equilibrium.

The remainder of the model is standard. There is a continuum of identical infinitely lived consumers who own labor and equity. Their preferences are given by:

$$E_0 \left[\sum_{t=0}^{\infty} \beta^t \log(c_t + \pi g_t) - \gamma(1 - n_t) \right]$$

where c_t and $1 - n_t$ are consumption and leisure respectively, and $\beta \in (0,1)$ is the subjective time discount factor. Government expenditures enter the utility function as an imperfect substitute for private consumption ($\pi < 1$). Every period consumers have a time endowment equal to 1. Following Hansen (1985) and Rogerson (1988), we assume that there are labor market rigidities so that consumers can work a fixed number of hours or none at all. To avoid non-convexities, consumers are assumed to trade employment lotteries. As a consequence, n_t is interpreted as the fraction of the population that works.

Capital goods are traded in complete markets. Firms purchase all available capital from the consumers at the beginning of the period and liquidate it after production. Managers choose the

allocation of labor among plants and make plant exit/stay decisions to maximize the firm's profits. Investment, nevertheless, is subject to an “efficiency” tax, τ , which includes the cost of distorting policies and macroeconomic conditions. These costs arise from distorted relative prices for goods and capital (using as benchmark world prices), trade protection, operating losses imposed by inadequate regulation (including corruption and red tape), financial over costs arising from non-competitive behavior in the part of financial intermediaries, etc.

The competitive equilibrium in this economy consists of contingent plans $\{c_t, i_t, k_{t+1}, n_t, S_t\}_{t=0}^{\infty}$, and contingent prices $\{w_t, q_t^0, q_t^1\}_{t=0}^{\infty}$ for labor, plants at the beginning of the period, and plants at the end of the period, such that, given contingent prices, the transfer T_t , and production and government stochastic processes $\{z_t, v_t, \lambda_t, \tau_t, g_t\}$. Hence:

a. The representative consumer solves:

$$\begin{aligned} \max E_0 \left[\sum_{t=0}^{\infty} \beta^t \log(c_t + \pi g_t) - \gamma(1 - n_t) \right] \\ c_t + (1 + \tau_t)i_t + \int_{\bar{v}}^{\infty} q_t^1(v_t)k(v_t)dv_t = w_t n_t + T_t + \int_{\bar{v}}^{\infty} q_t^0(v_t)k(v_t)dv_t \\ i_t = k_{t+1} - (1 - \delta)k_t \end{aligned}$$

b. Each plant satisfies

$$\begin{aligned} q_t^1(\bar{v}) &= s \\ q_t^0(v_t) &= (1 - \delta) e^{\lambda_t} \left(\frac{\bar{k}_t}{n_t} \right)^\alpha + 1_{(v_t < \bar{v}_t)} s + 1_{(v_t \geq \bar{v}_t)} q_t^1(v_t) \\ w_t &= \alpha e^{\lambda_t} \left(\frac{\bar{k}_t}{n_t} \right)^{1-\alpha} \end{aligned}$$

c. The government satisfies

$$g_t + T_t - \tau i_t = 0$$

d. The market clearing restriction is satisfied

$$c_t + i_t + g_t = y_t + S_t$$

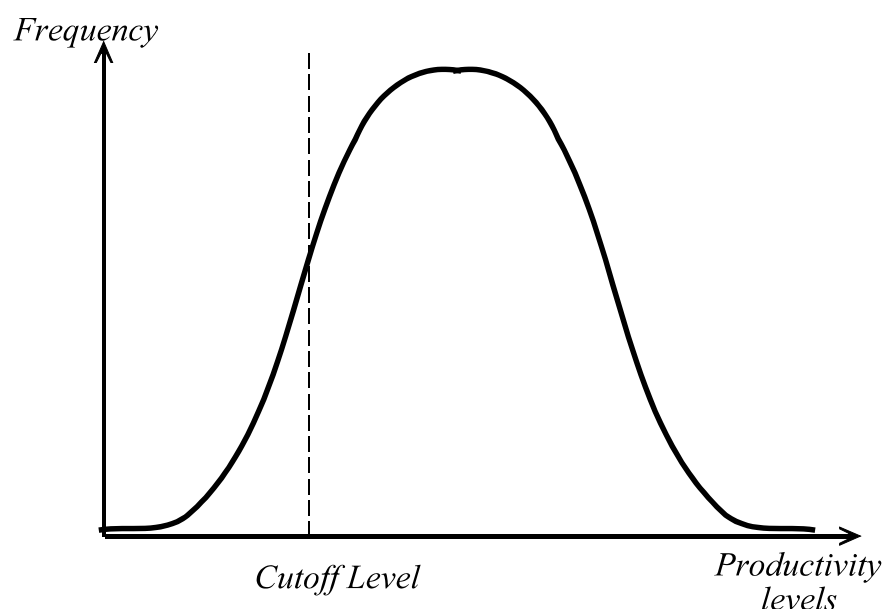
2.3 Model Solution

By nature, the model is highly non-linear. Hence, we do not attempt to solve and estimate it using standard econometric methods. Instead, the model is parameterized using Chilean manufacturing data as a benchmark and then simulated using numeric procedures. As represented by different parameterizations, the model would attempt to replicate the key reforms that have affected plant dynamics, thereby impacting on aggregate growth and market development, and specifically, on the dynamic process of market entry and exit.

Figure 1 shows the cross-section distribution of plant productivity in the economy, and the cut-off level at which firms decide to stay in or exit the market. Firms to the left of the cut-off level optimally leave the market, recovering the scrap value S_t . Their resources –labor and capital– are freed to be used by higher-productivity firms, either incumbents or incoming firms. Cut-off levels

depend on the deep parameters that govern the decisions of consumers, the nature of shocks, the level of technology and the existence of government induced distortions.

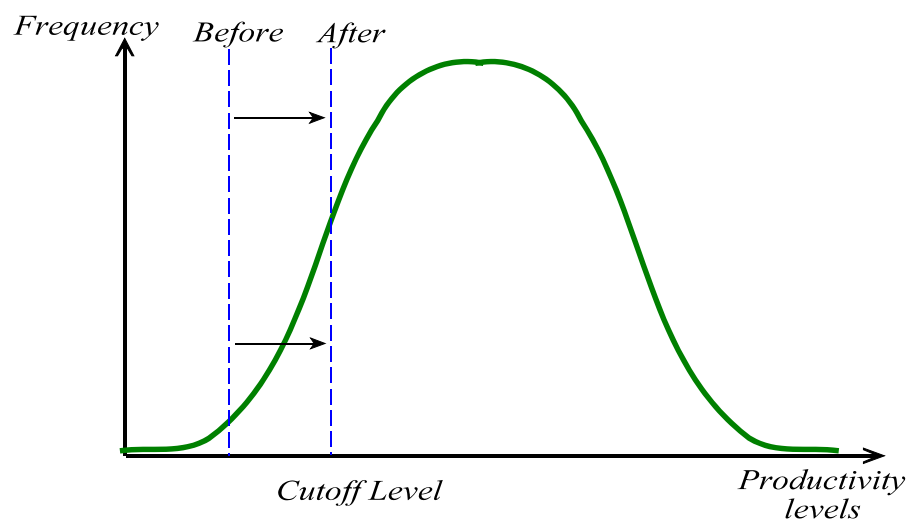
Figure 1
Cross-section Distribution of Productivity at the Firm Level



2.4 The Effect of Policies on the Distribution of Productivity and Cutoff Levels.

Policies and rigidities change the natural rates of birth and death of firms by distorting the optimal cutoff level. In turn, this distortion impinges on the process of technology adoption and, as a result, affects aggregate efficiency. Distortions have both static and dynamic effects. Consider first a production subsidy. Transfers made by the government allow inefficient plants, that would have otherwise exited the market, to stay longer in business. At the same time, more efficient firms that would have entered the market are left out. In terms of Figure 1, this moves the cutoff level to the left. The resulting inefficient allocation of resources initially pushes the economy inside its production possibilities frontier (since resources are misused). But there is an additional long term effect: because new firms are blocked out, the adoption of new and better technologies is delayed.

Figure 2
The Effect of Reforms in the Cross-section Distribution of Firms by Productivity Levels



According to this model, policies that affect the profitability of the production process imply a change in the cutoff level. The success of the Chilean economy in the 1980s and 1990s, hence, ought to be the result of reforms that precisely changed cutoff levels, so as to improve the resource allocation from inefficient to efficient producers. A key implication of the model is that as a result of reforms, microeconomic data should reflect important relocation of labor and capital not only across sectors (e.g, tradables vs. non tradables goods) but also within industries (e.g., low-technology to high-technology firms). This is depicted in Figure 2 as a movement to the right in cutoff levels. This would induce the static gains derived from reforms.

The following figures show the impulse response of the cut-off level and aggregate total factor productivity, for both permanent and transitory changes in a subsidy to the value of a plant at the end of the period. A permanent one-standard deviation increase in the subsidy reduces plant exit permanently. As a result, aggregate productivity declines until it converges to the new balanced growth path characterized by a lower level of income per capita (see Figure 3).

On the other hand, a transitory increase in the subsidy has a similar effect during the transition phase, but it leaves the equilibrium long run level of per capita income unaltered, as the economy returns to its original balanced growth path (see Figure 4).

Figure 3: Effect of a Permanent Increase in a Subsidy to the Value of an Incumbent Plant.

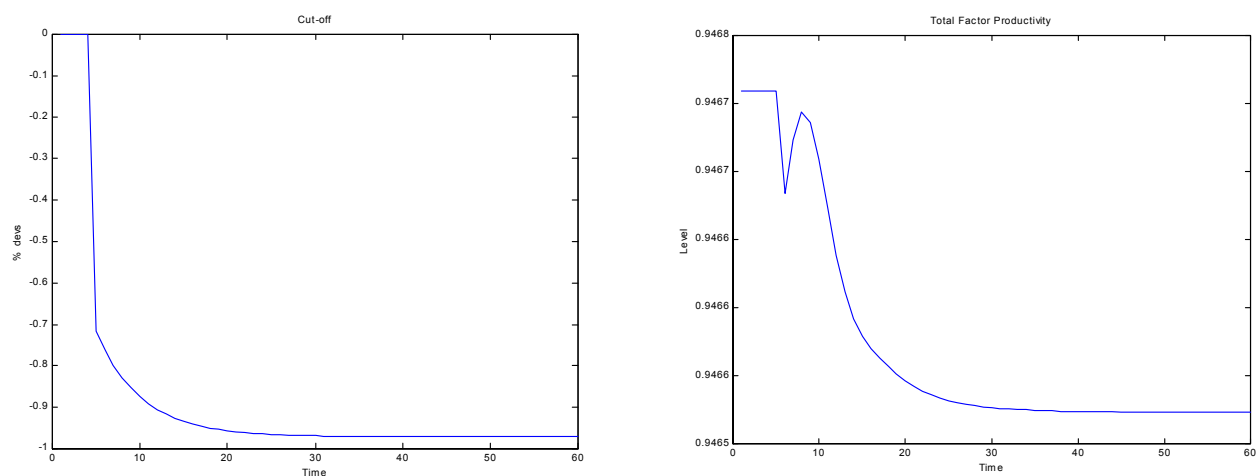
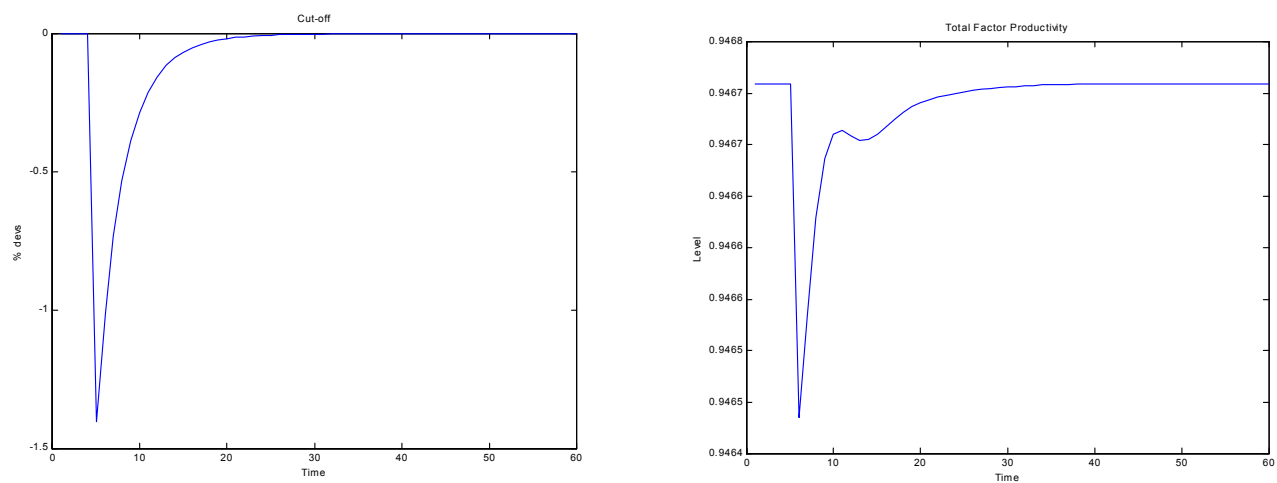


Figure 4: Effect of a Transitory Increase in a Subsidy to the Value of an Incumbent Plant.

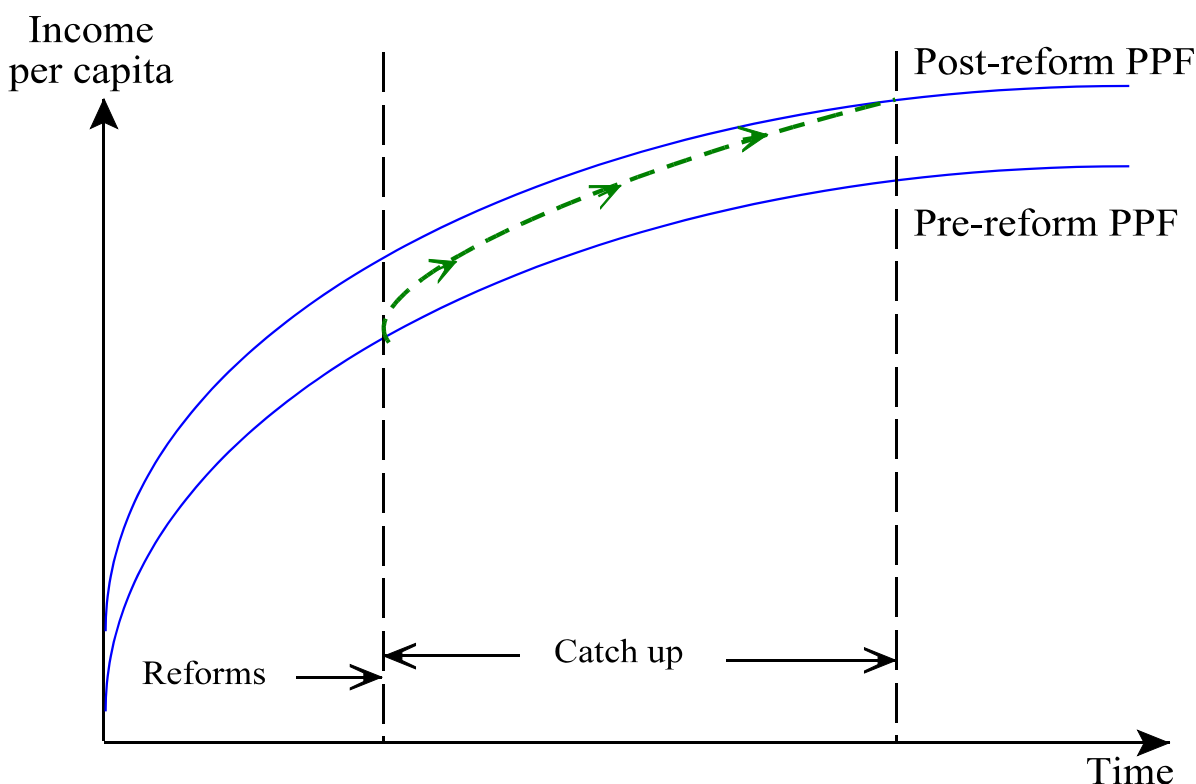


Moreover, these static gains also lead to important dynamic gains. A more fluid process of market entry and exit allow producers to adopt technology more efficiently. In the case of Chile that started its reforms from a relatively backward overall productivity level, reforms should lead to a discontinuity in the potential technological frontier available to the country. This is a result of allowing inefficient firms to exit the market and, for those resources left idle, the chance of being used with new, more efficient technologies. In Figure 5, this is shown as a jump in the potential productive possibility frontier of the economy. Consequently, as the economy starts to use more advanced techniques, it engages in a recovery process characterized by substantial increase in productivity levels and higher short-run growth in per capita income.

Given that in this model technological growth is exogenous, the balanced growth path of the economy is unaltered. What matters, however, is that the levels of productivity and per capita income can be substantially different whether reforms are undertaken or delayed. Thus, the model implies that as reforms continue to eliminate distortions –as described in Section 6– the potential production possibilities frontier will continue to expand until it reaches the international level of developed economies.

The model is consistent with the evidence presented in Section 3, where it is shown that the productivity in the Chilean economy grew quite fast after reforms, but tended to converge to more moderate growth rates by the end of the 1990s. As already mentioned, the 1979-85 period is characterized by important relocation of resources among sectors, while technology adoption plays a minor role. On the contrary, between 1986-1997, most of productivity gains are due to substantial changes in technology and a much smaller contribution of resource relocation.

Figure 5
Long Run Growth and Transitional Dynamics After Reforms



3. Characterizing Firms and Productivity Gains in the Chilean Economy⁹

The structure of firms in Chile in 2001 is presented in Table 3. The vast majority of firms corresponds to micro enterprises, defined as those with annual sales below US\$ 50,000 (which roughly corresponds to ten workers or less). On average these firms sell domestically about US\$ 10,500 a year and as a group they export a mere US\$ 35 million or 0.1% of total exports. Despite their minuscule size in terms of exports and sales, micro enterprises provide employment to 40% of the labor force. According to Bartelsman et al. (2003a), a similar phenomenon characterizes Europe and the U.S. in terms of the number of firms: micro enterprises account on average for

⁹ This section draws heavily from Bergoeing et al (2003a and b)

almost 89% of all firms. Nevertheless, on average they hire much fewer workers –only 26% of the labor force– than in the Chilean economy and, naturally, contribute less to GDP. Only Italy –where 34% of labor force work in micro-enterprises– comes close to Chile.

It should be noted that micro enterprises are extremely heterogenous in terms of their productivity and performance; these small enterprises comprise from rather inefficient, technologically backward firms (e.g., repair shops) to quite efficient, high-tech firms (e.g., computer designers, accountant services, consulting firms). Nevertheless, on average they are quite inefficient: average labor productivity hovers around US\$ 2,500 per year.

Small and medium size firms sell around 10% of total sales, but they differ markedly in terms of size, labor demand and orientation. Small firms, which on average sell around US\$ 165,000 each year employ roughly 37% of the labor force. On the other hand, medium size firms hire only 13% of the labor force and sell on average over US\$ one million per year. The latter also export significantly more than small firms. In terms of productivity, on average small firms have only one third of the average labor productivity of medium size firms.

Finally, large size firms (defined as those selling over US\$ two million) account for the lion share in sales and exports. These 6,000 firms account for 76% of sales and 95% of exports, while they hire less than 10% of the labor force. Average labor productivity levels are around ten times those of medium size firms and almost 100 times those of micro enterprises.

The average size of Chilean firms in terms of employment is rather small. Economy wide the average is 8.5 employees per firm, which is smaller than most European economies –whose average is 16.5 (as reported in Bartelsman et al., 2003a). Nevertheless, the Chilean level is not very different from that in Italy (10.5) or the Netherlands (6.5).

Table 3
Structure of Firms in Chile, 2001.

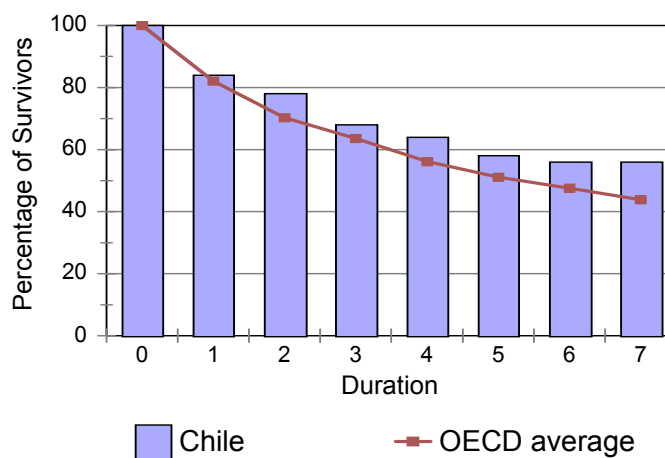
	Micro	Small	Medium	Large	Total
Number of firms	535,338	93,923	13,164	6,066	648,491
Average annual sales (US\$)	10,500	165,000	1,185,000	19,400,000	238,100
Average employees per firm	4	21	54	91	8
Average labor productivity (US\$)	2,530	7,699	21,817	213,964	28,074
Share in Number firms (%)	82.6	14.5	2.0	0.9	100.0
Share in Sales (%)	3.7	10.1	10.1	76.1	100.0
Share in Employment (%)	40.4	36.6	13.0	10.0	100.0
Share in Exports (%)	0.1	1.3	3.5	95.1	100.0

Source: Cabrera et al. (2002).

The cross-section description of Chilean firms suggests several similitudes in terms of structure –and some important differences– with regards to OECD countries. Similarities are, perhaps, more striking when one considers the pattern of firm entry and exit, i.e., the process by which firms are born, strive to persist, and eventually cease operations. Figure 6 presents the survival rates of firms in the manufacturing sector.¹⁰ We can see that after one year only 85% of firms that initiated activities are still in the market. After five years of operation, only around 60% of firms are still in operation, while by the seventh year less than one half of the firms are still in operation. These survival rates do not differ from those observed in the US or in Europe. According to Bartelsman et al. (2003), on average European countries and the US have a slightly lower survival rate for any age of firms beyond the second year.

¹⁰ The Enia, the survey from which the data are taken, gathers on plants with more than ten employees only. Thus, measurement of entry and exit is somewhat complicated by the fact that plants falling below the minimum employment boundary do not appear in the survey. Thus a plant surveyed in any given year, but that fails to enter the sample in the following year might not represent an exit. Similarly, a plant appearing for the first time in any given year does not necessarily correspond to an entry, as it might represent a growing plant that surpasses the ten people boundary. To reduce the extent of spurious identification of plant entry and exit, we artificially raise the sample threshold to 15 employees.

Figure 6
Survival Rates of Firms
in Chile and OECD countries, 1985-1997



Source: Bergoeing et al. (2003) for Chile
 Bartelsman et al (2003) for OECD countries.

As expected, plant entry and exit produce substantial creation and destruction of labor. Firms that exit the market destroy labor at rather high rates: between 1981 and 1992, employment was destroyed at annual rates of 13.6% (see Table 4). Nevertheless, firm entry created employment at higher rates: on average, it reached 16.2% for the same period. These seemingly high rates, however, are not very different from those observed in OECD countries. As shown in Table 2, turnover rates in Chile are slightly higher than, but within the range of, OECD countries. This evidence is striking, particularly if one considers that reforms in Chile induced substantial changes in relative prices and massive resource relocation.

Table 4
Annual labor creation and destruction rates in Chile and OECD countries

Country	Sample	Operating Unit	Employment Creation (%)	Employment Destruction (%)
Chile	1981-92	Plant	16.7	13.6
Canada	1974-92	Plant	10.9	11.1
Denmark	1981-91	Plant	12.0	11.5
France	1985-91	Firm	10.2	11
Netherlands	1979-93	Firm	7.3	8.3
Norway	1976-86	Plant	7.1	8.4
USA	1973-93	Plant	8.8	10.2
USA	1979-83	Plant	10.2	11.5

Source: Cabrera et al. (2002).

Another striking similarity with OECD economies is the presence of large and persistent differences in factor input usage and output across sectors and firms. Increasing availability of micro-level data in developed economies has allowed the documentation of a widely accepted regularity: for high levels of disaggregation and even within the same sector and period of time, plants accumulate and destroy jobs and capital at a highly different pace. Evidence for Chile, as presented in Camhi et al. (1997) and Bergoeing et al. (2003), is consistent with these findings.

Several factors have been considered to account for the observed heterogeneity. Among others, the uncertainty that surrounds the production process, in particular with respect to the development and adoption of new production techniques, and the distribution and marketing of new products. Firms experiment with different production processes as they lack full information on the demand conditions and cost effectiveness of alternative technologies. Another factor that may generate heterogeneity in plant-level behavior is differences in managerial skills, e.g., the ability to adapt to a changing environment. Finally, as described in the model of section 2, shocks that are specific to plants and firms are likely to cause dynamic heterogeneity. Plants faced with specific productivity shocks respond differently, creating and destroying capital and jobs in a manner consistent with their profit maximization behavior. Within this setting, a continuous process of entry

and exit is also observed as, at any period of time, new plants are entering the market and some old plants are shutting down.

As reported by Bergoeing et al. (2003c), and consistent with the international evidence, Chilean manufacturing data show substantial evidence of heterogeneity at the plant level. Moreover, Bergoeing et al (2003b) provide empirical support for the role of policy distortions as a source of the observed heterogeneity, as explained in Section 2.

Table 5 shows that there are wide differences in average total factor productivity levels across sectors.¹¹ Although productivity fluctuates markedly over time, 6 of the 8 sectors display an upward trend, indicating that, on average, manufacturing sectors have become more productive in Chile over the period of analysis –the exceptions being beverages and wearing apparel. In other words, average productivity growth is positive. Thus, over time industrial production is growing faster than inputs, particularly during the 1990s.

Table 5.
Weighted Average Productivity at the Industry Level
Thousands of 1985 Chilean pesos.

Year	Food Products (311-12)	Beverages (313)	Textiles (321)	Wearing Apparel (322)	Wood Products (331)	Plastic Products (356)	Metal Products (381)	Machinery (382)
1980-81	1,341	4,009	2,502	908	652	1,087	1,884	5,490
1982-84	1,922	1,920	2,410	854	1,559	1,028	1,690	4,490
1985-90	1,881	1,784	2,697	628	1,091	1,140	2,214	4,469
1991-99	3,051	2,900	3,041	836	975	1,062	2,750	9,798
1980-99	2,359	2,529	2,789	784	1,065	1,082	2,343	6,972

Source: Elaboration using data from Bergoeing et al. (2003a).

Numbers in parentheses are ISIC codes.

¹¹Bergoeing et al (2003a) estimate TFP at the plant level using Olley and Pakes (1996) methodology. They restrict the analysis to eight 3-digits subsectors to concentrate the analysis in sectors characterized by competition and hence to reduce the extent of TFP mismeasurement.

On the other hand, productivity levels are actually quite heterogeneous within sectors and across periods of time (see Table 6). Note that, in most sectors, differences among firms increase in periods of expansion –such as 1991-99– which is consistent with the entry of new firms that are more productive. These large differences in productivity among firms in an industry are one likely explanation for the heterogeneity in employment and capital accumulation observed in the Chilean economy.

Table 6.
Standard Deviation of Productivity Levels at the Industry Level
Thousands of 1985 Chilean pesos.

Year	Food Products	Beverages	Textiles	Wearing Apparel	Wood Products	Plastic Products	Metal Products	Machinery
1980-81	823	6,253	1,534	495	349	598	945	2,370
1982-84	835	993	1,117	498	536	506	980	3,108
1985-90	964	879	1,230	434	504	560	942	2,055
1991-99	1,322	1,902	1,560	479	551	500	1,296	4,162
1980-99	1,091	1,894	1,392	470	514	529	1,107	3,193

Source: Elaboration using data from Bergoeing et al. (2003a).

Table 7 reports the ratio of average productivity growth to average value-added growth, as a measure of the contribution of productivity to growth. In all sectors the correlation between value added and productivity growth is positive and large, ranging from 0.67 for wood products to 0.93 for plastic products; i.e. productivity growth is procyclical. However, this correlation does not account for the sharp differences in the contribution of TFP growth within sectors over time, and across sectors in any given year. During the 1984-1997 period of rapid and sustained growth, value added grew faster than productivity, although during the 1990's these differences tend to disappear. As a matter of fact, for all sectors, the 1990's reflect an almost equal growth in value added and productivity, i.e., growth is mainly explained by increases in efficiency and not by higher accumulation of factors. This is consistent with the evidence at the aggregate level over periods of sustained growth. Input factor accumulation, however, may be very important during short periods

of time and after structural reforms. For instance, the lower –although still high in level– contribution of productivity to growth during the second half of the 1980's, may reflect the importance of social security and tax reforms implemented during that period that spurred investment in Chile. Finally, even within time periods, sub sectors display significant behavioral differences. This evidence suggests that the contribution of TFP to growth is volatile, and that it varies with economic upturns and downturns.

Table 7.
Ratio of Annual Growth Rate of Productivity to Value Added Growth (%)

Year	Food Products	Beverages	Textiles	Wearing Apparel	Wood Products	Plastic Products	Metal Products	Machin.
1980-81	1.26	-0.69	1.02	0.33	-30.88	1.16	0.91	1.96
1982-83	-0.37	0.26	9.14	1.06	-8.99	4.64	1.51	-3.48
1984-89	6.62	-1.18	1.03	1.81	1.64	1.36	1.33	0.95
1990-97	2.05	1.82	-0.45	0.33	2.33	2.10	0.74	1.13
1998-99	8.67	0.56	0.93	2.22	0.94	0.72	0.90	-0.65
Correlation V.A.-prod. growth rate	0.74	0.79	0.80	0.74	0.67	0.93	0.90	0.77
Correlation V.A.-prod. level	0.97	0.21	0.84	0.69	0.85	0.96	0.98	0.98

Source: Bergoeing et al. (2003a).

These estimates of total factor productivity are highly correlated with average labor productivity. Correlations range from 0.57 in plastic products to 0.94 in the food and machinery sectors. Since estimates of plant-level total factor productivity are usually not available, it is common to use average labor productivity to study the connection between efficiency and plant dynamics. Total factor productivity is, however, the right concept to understand the link between efficiency and the behavior of plants. As a matter of fact, the evolution of labor productivity can be decomposed into the contribution of the reallocation of inputs and the changes in total factor productivity. In other words, labor productivity is endogenous to TFP. The understanding of each

source separately is relevant. For instance, while the former is bounded by the efficient allocation of resources, the latter is unbounded and represents a plausible source of long-run growth. Thus, the characterization of total factor productivity, as presented in Table 5, allows a comprehensive understanding of long and short run growth.

Table 8 compares the mean productivity levels of startups and shutdowns to the mean productivity of continuing plants. On average, plants that shut down have lower productivity than incumbents in the beverages, wearing apparel, plastic products, and machinery industries. In the food, textiles, wood, and metal products, exiting plants display higher productivity than the average continuing plant. At a first sight, this latter result seems counterintuitive. However, higher capital stocks allow less productive plants to stay in the market despite lower levels of productivity. Furthermore, it is possible that exiting plants belong to a subsector within the industry with higher than average productivity, or that they shut down in the final sample years, when average productivity is higher. Finally, some incumbents are able to stay longer in the market than the average firm due to the existence of targeted policies, as explained in Section 2. Empirical support for this hypothesis is provided in Bergoeing et al. (2003b). Startups, on the other hand, are more productive than the incumbents in most sectors, while only in food and machinery new firms display markedly differences with average productivity levels.

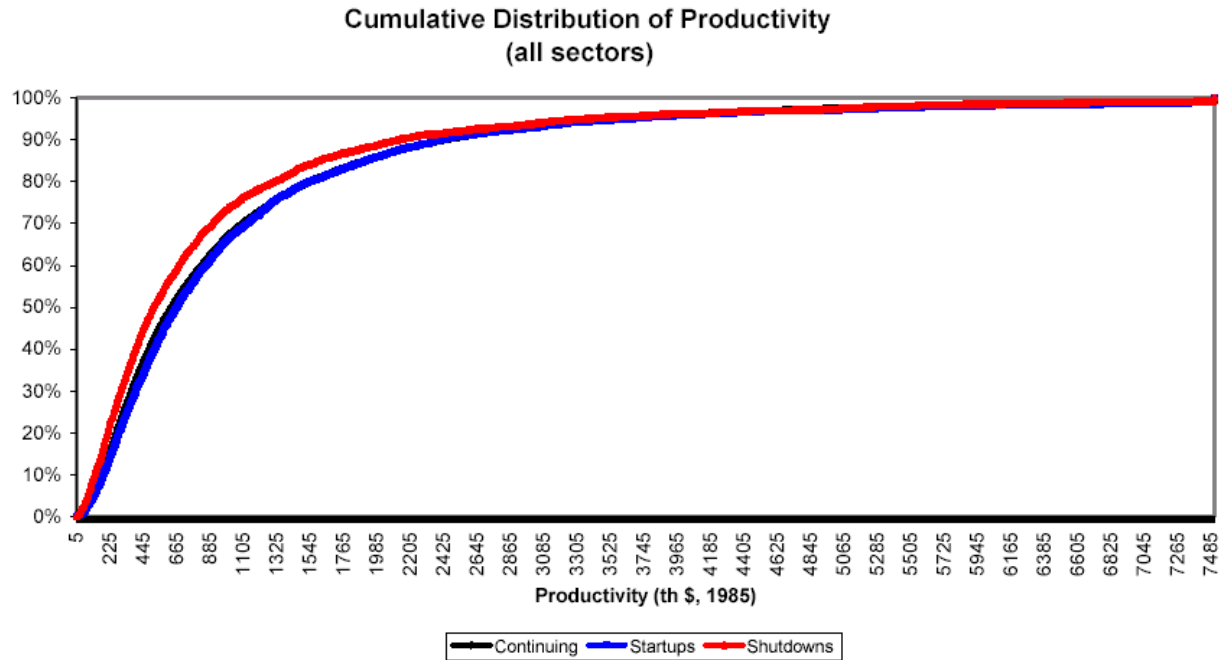
Table 8.
Weighted Average Productivity of Continuing, Entering, and Exiting Plants
 Productivity in thousands of 1985 Chilean pesos.

	Incumbents	Startups	Shutdowns	Relative to Incumbents	
				Startups	Shutdowns
Food Products	2,629	1,671	2,879	0.64	1.09
Beverages	2,697	7,561	2,514	2.80	0.93
Textiles	2,796	2,649	3,127	0.95	1.12
Wearing Apparels	837	1,222	786	1.46	0.94
Wood Products	1,045	1,480	1,565	1.42	1.50
Plastic Products	1,073	1,743	922	1.63	0.86
Metal Products	2,540	2,676	3,365	1.05	1.32
Machinery	8,498	6,957	7,673	0.82	0.90

Source: Bergoeing et al. (2003).

To better understand the differences in the productivity of incumbent plants, shutdowns and startups, and following Bergoeing et al (2003a), we constructed the cumulative distribution of productivity for these three groups of plants. Figure 7 shows these distribution functions for the full sample. No matter the level of productivity, the distribution of shutdowns is to the left of the distribution of productivity of continuing plants. In other words, the probability of exceeding any given level of productivity is higher among continuing plants than shutdowns, and thus the first distribution first order stochastically dominates the second distribution. This pattern is also found at the 3-digit aggregation level in most cases. Bergoeing et al (2003a) provide formal test that support these findings.

Figure 7



To formally investigate the relationship between exit and efficiency, Table 9 reports the results of probit regressions that explain deaths as a function of productivity and capital. As expected, all sectors show a negative effect of productivity and capital on the probability of death; i.e. larger and more productive plants have a higher survival rate. In all but one case, the effects of efficiency are statistically significant. However, the magnitudes of the effects are not large, as one standard deviation in productivity reduces the shut down probability by 0.3 to 4 percentage points. Perhaps these effects are small because plants in our sample already have on average probabilities of survival larger than 0.92.

Table 9. Probability of Plant Death

	Coefficient		Marginal Effect	
	Productivity	Capital Stock	Productivity	Capital Stock
Food Products (311)	-5.64E-05 2.26E-05	-9.44E-08 3.20E-09	-5.75E-06	-9.62E-09
Beverages (313)	-1.25E-04 4.93E-05	-1.73E-07 8.81E-08	-1.34E-05	-1.85E-08
Textiles (321)	-9.53E-05 2.48E-05	-2.55E-07 1.12E-07	-9.80E-06	-2.62E-08
Wearing Apparel (322)	-2.10E-04 7.20E-05	-3.69E-07 3.09E-07	-2.96E-05	-5.19E-08
Wood Products (331)	-1.69E-04 6.81E-05	-1.16E-07 8.84E-08	-2.50E-05	-1.72E-08
Plastic Products (356)	-4.52E-04 1.04E-04	-2.89E-07 1.50E-07	-4.17E-05	-2.66E-08
Metal Products (381)	-2.65E-05 2.37E-05	-4.37E-07 1.56E-07	-2.54E-06	-4.19E-08
Machinery (382)	-5.05E-05 1.76E-05	-2.68E-07 1.82E-07	-5.13E-06	-2.71E-08
All sectors	-6.28E-05 9.69E-06	-1.43E-07 2.57E-08	-7.04E-06	-1.60E-08

All probit regressions include a full set of time dummies. The pooled regression also includes a full set of sectoral dummies. The second entry is the standard error.

While comparing plant productivity levels is useful to document heterogeneity from a static point of view, what matters for long-run growth is the contribution to productivity growth of continuing, entering, and exiting plants. Following Levinsohn and Petrin (1999), productivity growth is decomposed in four parts: (1) the reallocation of output across continuing plants, (2) the growth in TFP of each plant in the industry, (3) the productivity of entrants, and (4) the loss in productivity associated to plants that exit. This decomposition, as a fraction of total average productivity growth, is presented in Table 10.

Table 10.
Contribution of Startups, Continuing, and Leaving Plants to Productivity Growth

Year	Food Products	Beverages	Textiles	Wearing Apparel	Wood Products	Plastic Products	Metal Products	Machin.
Relocation among existing plants								
1982-83	0.39	-0.03	4.08	-13.49	0.46	-0.03	0.83	0.36
1984-89	1.16	6.99	-0.76	10.79	0.50	0.14	0.33	0.37
1990-97	0.44	0.95	-0.07	0.70	0.26	1.06	-0.05	0.23
1998-99	0.39	-5.32	0.02	0.34	1.23	1.87	0.98	0.98
Growth in TFP of continuing plants								
1982-83	0.57	0.84	-4.89	11.76	0.61	0.90	0.68	1.37
1984-89	-0.08	-5.81	-0.74	-10.03	0.85	0.97	0.76	0.76
1990-97	0.58	0.55	1.41	0.70	0.55	0.27	0.74	0.82
1998-99	0.81	-5.56	-0.01	0.91	0.93	1.15	0.60	1.17
Productivity of entering plants (gain)								
1982-83	0.00	-0.09	-0.07	-0.05	0.00	0.00	0.00	0.00
1984-89	0.05	-0.03	-0.08	1.62	0.56	0.01	0.05	0.10
1990-97	0.01	0.00	-0.68	-0.04	0.00	0.13	0.42	0.00
1998-99	0.00	0.00	0.00	-0.10	0.00	0.00	0.00	0.01
Productivity of exiting firms (loss)								
1982-83	-0.04	-0.28	-1.89	-2.78	0.07	-0.14	0.51	0.00
1984-89	0.13	0.15	-2.59	1.38	0.90	0.12	0.14	0.23
1990-97	0.03	0.50	-0.34	0.36	-0.20	0.46	0.11	0.04
1998-99	0.20	-11.88	-0.99	0.14	1.16	2.02	0.58	1.16

Source: Bergoeing et al. (2003a).

The large number of positive figures in the first panel reflects the fact that output tends to be reallocated towards more productive plants when aggregate productivity grows. The second panel shows the effect of each continuing plant productivity growth. The third panel shows the

contribution of entering plants, which is zero in most cases, because of the small number of entries we observe in our data set. Finally, the last panel shows the loss in productivity due to plants that exit. In most cases, this loss is relatively small. However, in some cases, we observe that these plants' productivity represents a very large share of total productivity growth.

In Table 11 we characterize plant level TFP according to plant age. Contrary to the theoretical predictions, these relationships are not monotonic. Furthermore, in some sectors the age profiles are downward sloping, as older plants tend to be less productive than their younger counterparts (wood, plastic and metal products.) These age profiles in Table 10 confound cohort, age and time effects. Age effects capture the life-cycle of plant level productivity. For instance, if there are learning-by-doing effects, then plants become more productive as they age. Selection effects may also account for an increasing age profile of plant level TFP, as the less productive plants shutdown at earlier ages. However, if different vintages of plants had access to different technologies when they were born, and if the technology frontier continually improves, then older plants -- those born earlier -- display a lower average TFP level. Thus plants in the sample observed at age 20 were born long before those we observe at younger ages and so have on average lower lifetime TFP. Ignoring these birth-year effects leads to a negative bias in the estimate of the slope of the age profile. Finally, year specific effects, such as the stage of the business cycle, may affect average TFP of plants in each year, as aggregate shocks account for a share of individual uncertainty. If certain plants are observed only in the downside of the business cycle, we would then incorrectly assign them a negative age effect.

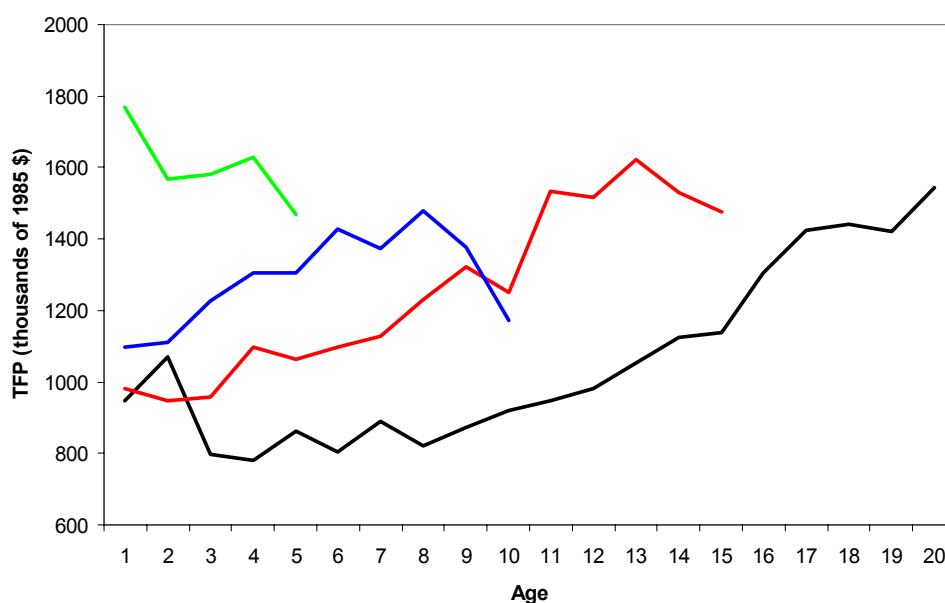
To control for these different effects, we decomposed TFP into age, cohort and time effects. We followed Deaton and Paxson (1994) and attributed growth in TFP to cohort and age effects, and cyclical fluctuations to year effects. As in Deaton and Paxson we normalized the effects such that year effects average to zero over the long run.

The first panel of Figure 8 displays average TFP for four cohorts observed over the 1980-1999 period. The older cohort is composed of plants that entered the market between 1980 and 1984. The other three cohorts are formed by plants that were established between 1985 and 1989, 1990 and 1994, and 1995 and 1999. Each line in the figure tracks average TFP of plants in each cohort over the sample period. That is, the first point in the top line shows average TFP of the youngest cohort in 1995. The second point shows average TFP for this same group in 1996, and so

on. The figure shows that there are separate cohort and age effects in plant level TFP. In most cases, at any given age, the lines for younger cohorts are above the lines for older cohorts. For instance, at age four the youngest cohort displays a level of productivity that is about twice that of the oldest cohort. This difference reflects the effects of technical progress on different vintages of plants. There is also an upward sloping life-cycle profile, most evident for the cohorts observed for a longer time period. The age profile of the youngest cohort is downward sloping, possibly because we only observe its TFP over a period slow growth.

The next three panels of Figure 8 show the decomposition into age, cohort and year effects. The estimated cohort effects are declining with age; i.e., plants born later have access to better technologies, and thus display higher average TFP. Age effects decline until age three, to then become positive and upward sloping. This initial decline is consistent with selection effects that lead the least productive plants to leave the market at young ages. The rest of the life-cycle profile is also consistent with learning effects. Year effects follow the pattern of the Chilean business cycle. The effects fall dramatically between 1981 and 1982, and then steadily until 1987. Then they rise as the economy grows much faster, to finally fall after 1995. These year effects explain why the total age

Figure 8a. TFP by Cohort



profile of the youngest cohort in the first panel is downward sloping, as the group is observed only through the 1995-1999 period. Finally, our results show that TFP is driven mostly by age and cohort effects, as cyclical fluctuations account for a small share of overall productivity.

Figure 8b. TFP Decomposition: Age Effects

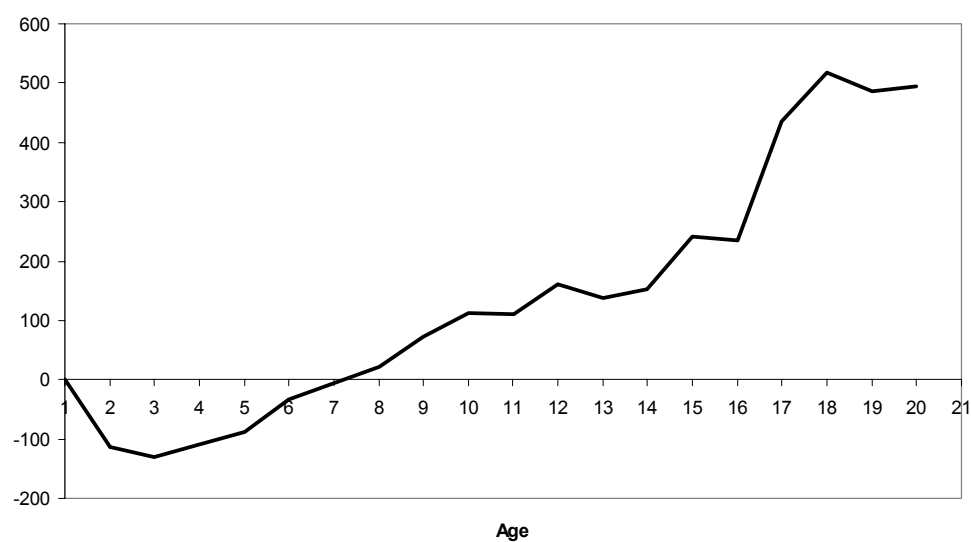


Figure 8c. TFP Decomposition: Cohort Effects

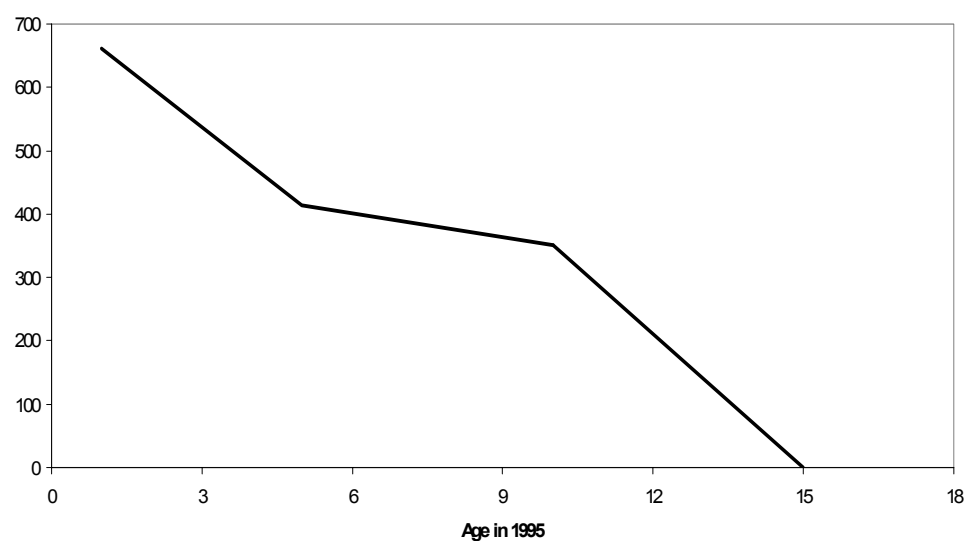
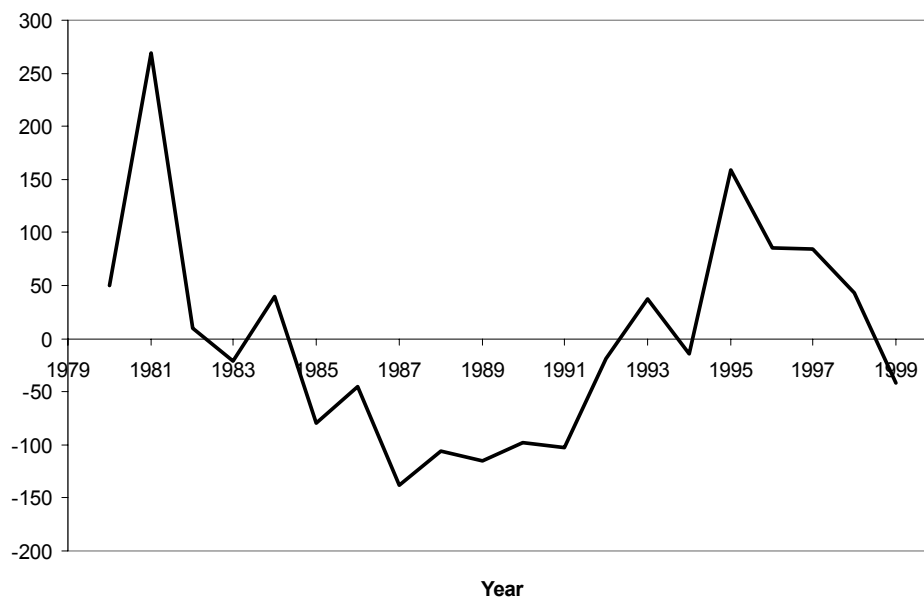


Figure 8d. TFP Decomposition: Year Effects

We now turn to the effect of TFP on factor demands. According to the theoretical framework, investment should be increasing in productivity. The demand for labor must also be increasing in productivity. Bergoeing et al (2003a) provides estimations for investment and labor as a function of productivity levels and other control variables. The results are consistent with our model: investment responds positively to productivity shocks in all but one sector (beverages). When looking at plant level employment, most sectors, but machinery and food processing, have positive and significant coefficients. The positive and statistically significant correlations found between plant-level investment and employment, and total factor productivity, provide empirical support for idiosyncratic productivity shocks as an important source of heterogeneity in plant dynamics.

Table 11.
Average Productivity by Plant Age
 Thousands of 1985 Chilean pesos.

Age	Food Products	Beverages	Textiles	Wearing Apparel	Wood Products	Plastic Products	Metal Products	Machin.
1	1,697	1,141	3,420	1,176	1,014	3,043	3,363	4,582
2	2,200	10,159	3,920	1,754	1,927	2,143	3,869	8,050
3	1,800	2,294	3,617	1,254	1,424	1,184	3,034	7,286
4	1,846	1,721	3,437	860	1,205	1,012	2,271	8,406
5	1,552	1,677	3,003	964	1,055	1,188	3,248	7,980
6	1,701	2,452	2,710	1,427	1,476	1,284	2,710	9,092
7	1,512	2,416	2,775	729	907	1,157	2,729	16,115
8	1,500	2,140	2,825	669	1,115	1,109	2,112	10,404
9	1,724	2,229	3,535	709	793	1,230	2,916	9,724
10	1,350	2,386	3,418	723	938	1,048	2,988	7,671
10+	2,866	2,528	2,730	775	854	983	2,452	8,215

Source: Bergoeing et al. (2003).

The previous data provide support for our theoretical priors. Plants dynamics are consistent with a process of profit maximization undertaken by plants. In general, older, bigger and more outward oriented plants are more productive. Moreover, idiosyncratic productivity shocks are a quantitatively relevant source of the observed heterogeneity in plant dynamics. The assumed heterogeneity in productivity is consistent with several possible factors, already considered in the literature. Among them, the uncertainty that surrounds the production process and the ability of plants to adapt to a changing environment. In addition, as explained in Section 2, policies that vary over time and across sectors emerge as a potential source for such heterogeneity. As a matter of fact, policies - and rigidities in general - that affect current and expected productivity, can interfere with the natural rates of birth, growth, and death of firms, stagnating employment, and reducing aggregate

efficiency. Thus, competition, either as a result of privatization or liberalization of trade, may provided the necessary setting to promote an efficient allocation of resource and the basis to promote higher aggregate income per capita and the ability to recover rapidly after facing negative aggregate shocks.

Several reforms, undertaken during the 1970s and 1980s in Chile, are consistent with this line of analysis. As already mentioned, the main reforms in Chile relied on liberalizing the markets and allowing relative prices to be market determined; the government's intervention was restricted to the control of market distortions. Next, in Sections 4 and 5 we analyze the two most important reforms for plant dynamics: the deregulation and deepening of the financial sector and the liberalization of foreign trade. From these sections we derive several lessons about the response of firms to changes in macroeconomic conditions and, more importantly, we collect insights on the need for further reforms that would enhance the performance of the Chilean firms.

4. Financial Sector Reforms and Microeconomic Performance.

This section explores the response of firms to financial reforms in the 1980s and 1990s. Our objective is to twofold. First, we would like to understand how firms adjusted to the substantial changes that the Chilean financial sector experienced to derive policy lessons. Second, we would like to identify policy distortions and market imperfections that currently reduce the efficiency and hamper the ability of the financial sector in supplying funds to firms with profitable investment projects. This link is, naturally, a key determinant of sustained growth.

4.1 Financial Sector Reforms¹²

Financial sector reforms played an important role in shaping the development of the Chilean economy. Since the mid 1980s there has been a remarkable growth in banking intermediation and stock market capitalization, placing Chile as Latin America's financial leader a decade later. By 2002, the ratio of credit allocated by deposit money banks to GDP in Chile was 46%, almost fifty

¹²This section draws heavily from Gallego and Loayza (2000).

percent larger than Brazil's, the second country in the region in this respect. By the same year, stock market capitalization as a ratio of GDP reached 105% in Chile, at least three times larger than in any other country in Latin America (Loayza and Palacios, 1997).

Before discussing the microeconomic effects of this remarkable expansion of the financial sector, it is important to examine the macroeconomic developments in the Chilean financial system in the last two decades to understand the main characteristics of the regulatory environment (see Gallego and Loayza (2000), for details). Prior to 1973, the financial sector was extremely regulated, reflecting the inward-looking development model implemented in those years in Chile and most other Latin American countries. This meant the prevalence of interest rate controls, quantitative restrictions on credit, mandated allocation of credit to priority sectors, and extensive state ownership of banks and other financial institutions.

Reforms started with the removal of most regulations affecting the banking sector. Interest rates were completely freed by 1975 and quantitative controls on credit were eliminated by 1976. Between 1975 and 1980, entry barriers and liquidity requirements were diminished, state-owned banks were privatized and the capital account was gradually opened. Other reforms allowed the development of the insurance, bond, and stock markets. In 1976, a stock register was created and the public disclosure of information was made mandatory. In 1980, insurance market rates were liberalized while prudential regulations on insurance companies' portfolios were implemented. The same year, a fully funded pension system began to operate, and private institutions started to manage pension funds, investing in various financial instruments. In 1981, laws destined to protect minority shareholders and prevent the misuse of privileged information were enacted.

In contrast to the prudential regulation established for capital markets, the banking sector lacked effective public disclosure mechanisms and a well-developed regulatory and supervisory system. Furthermore, there existed an implicit State guarantee on deposits (as a result of the government's decision to rescue failed Banco Osorno in 1976) and banks were highly leveraged (as a result of the financing mechanisms of bank privatizations). This created moral hazard problems that deteriorated the banks' asset portfolio and prepared the grounds for a banking crisis. In addition, the balance sheet of banks suffered from a maturity and currency mismatch, placing them in a vulnerable position that was made manifest by the macroeconomic shocks in the first half of the 1980s.

Negative terms-of-trade shocks, a sharp increase in international interest rates, and a consequent large devaluation of the Chilean peso triggered massive failures in the financial sector. Between 1982 and 1985, the government intervened 21 financial institutions –of which 14 were liquidated. The liberalization process was transitorily reversed since the state became the manager and main creditor of rescued banks and financial controls –such as restrictions on external capital movements– were reinstated.¹³

The massive cost involved in rescuing the financial sector led the government to reshape the architecture of the financial sector. A new banking law was enacted in 1986 establishing a modern prudential regulation, an enforced supervisory capacity by the state, and an explicit deposit insurance. The new banking law included limits on debt-to-capital ratios, incentives for private monitoring of banks through both a partial public guarantee on deposits and the mandatory information disclosure to the public, and separation between the core business of the bank and that of its subsidiaries. The regulatory framework for other capital markets was also strengthened during this period. A new bankruptcy law that clarified the extent of private sector responsibility in failing enterprises was enacted.

The privatization of large state enterprises, the re-capitalization of rescued banks, and a significant external debt-to-equity conversion by private firms strongly promoted the development of the stock market and of pension fund managers (the largest institutional investors in Chile). This contributed to extend the ownership of capital throughout society.

Reforms were strengthened throughout the 1990s and a number of constraints on the capital account lifted. Firms with good credit rating were allowed to issue bonds and shares in external markets, institutional investors (banks, pension funds, and insurance companies) were allowed to hold external assets, and international trade payment transactions were liberalized.¹⁴ Nevertheless, the Central Bank maintained unremunerated reserve requirement on external funds until 1998, on the grounds that it deterred volatile short-run capital flows. In 1997, a new capital market law was passed by Congress that regulated the participation of banks in non-traditional areas, such as factoring, non-pension insurance, and investment banking. Permanence requirements on foreign

¹³ See Barandiarán and Hernández (2003) for details.

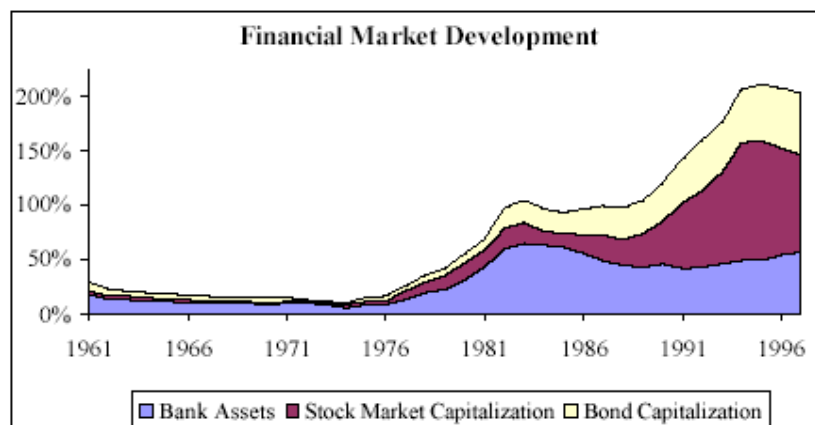
¹⁴ See Gallego, Hernández and Schmidt-Hebbel (1999) for details.

investment –both portfolio and direct– were reduced from an average of eight to three years in 1991, and further to two-and-a-half and one years in 1992-93, before being completely eliminated in May 2000.

The early 2000s saw the introduction of Central Bank nominal bonds (previously financial instruments were denominated in real terms). These have created a more liquid medium-term market in pesos, making intermediation in peso-denominated funds over longer maturities easier and expanding consumer credit and automobile loans. Similarly, some banks have started to offer mortgages in pesos, marking the beginning of long-term market in this currency.

4.2 Financial Sector Size, Performance and Efficiency

Since the mid-1970s, the financial system in Chile has grown relative to the size of the economy (see Figure 9). The banking sector grew significantly in the late 1970s and moderately in the last two decades. The bond market expanded especially since 1980, whereas the stock market experienced a striking increase in the 1990s. Moreover, the overall growth of the financial sector during this period was accompanied by a significant change in its structure and composition. However, it should be noted, growth in financial markets has not been smooth: the banking credit boom that took place before the 1982 crisis was mostly reversed, and so was the stock market expansion in 1983-84. To a lesser extent, the decrease in stock market capitalization in 1996-97 can also be interpreted as a partial reversal of the strong expansion of the stock market in the early 1990s.

Figure 9

Source: Jeftanovic (1979), Beck et al. (1999), Central Bank of Chile, and CB Capitales.

Banks' financial assets as a fraction of GDP exhibit a growing trend from 1977, with a downward correction in the mid-1980s. By 1997, the financial assets of the banking sector represented 55% of GDP, a proportion higher than the world average (52%) and the largest in Latin America (whose average is around 28%). The evolution of private credit extended by commercial banks relative to GDP shows a sustained growth from 1974 to 1982, a reversal from 1982 to 1988, and a new increase from 1991 onwards. In the 1990s, banking activity experienced a moderate and steady growth, following the new regulatory framework of the late 1980s and accompanying the fast development of other financial sectors, mainly the stock and bond markets.

Gallego and Loayza (2000) assess the efficiency of the banking sector. They found that overhead costs and gross margins of the banking sector fell notably in the late 1970s at the start of the liberalization process. Spreads on short-run (less than a year) banking lending and borrowing operations tell a similar story. In the 1990s, these indicators remained relatively stable. This should not be taken to imply that the sector's efficiency has stagnated during the period. According to Basch and Fuentes (1998), this stability is related to the higher degree of competition faced by banks in providing financing sources, which has led them to concentrate in alternative markets, such as personal banking or small to medium firms, which are associated with higher costs.

Stock markets, on the other hand, evolved in a different, yet characteristic, manner. Capitalization relative to GDP grew gradually in the 1970s and 1980s and experienced a rapid

expansion in the last decade, reaching 105% of GDP in 1995. Only in the 1990s the size of the stock market in Chile became larger than the world average (which was 18.5% in the 1970s, 28.4% in the 1980s, and 38.2% in the 1990s). The remarkable expansion of stock market capitalization deserves further attention. As discussed in Gallego and Loayza (2000), the conventional measure of stock market capitalization combines stock price movements with changes in the quantity of stock shares. While both price and quantity increases indicate larger stock market depth, the strong expansion in stock market capitalization since the mid-1980s has been mostly driven by price effects. In fact, the behavior of the “quantity” of stock shares may put in question whether the growth of stock market capitalization can be identified with improved financial intermediation through stock markets.

The evolution of the value of stock market transactions to GDP shows a gradual increase in the 1970s and a rapid rise since 1985, which led the stock market activity to reach a peak of 17% of GDP in 1995. Despite this growth, using the world average as comparison, the stock market in Chile would still be classified as underdeveloped. Nevertheless, since 1990, firms with good credit rating are allowed to issue shares abroad, suggesting that total value should include traded value in the Chilean stock market and abroad. When their activity in the U.S. stock markets is included, traded value doubles reaching at its peak 35% of GDP in 1995. However, given the large transaction costs involved in issuing shares abroad, medium- and small-size firms are in practice restricted to operate in the still relatively illiquid Chilean stock market (see Caballero, 2002).

The turnover ratio—a measure of efficiency of stock markets—shows a significant rise during the 1990s, especially after 1992 when Chilean shares began to be traded offshore. As in the case of the traded value to GDP, total turnover is also twice as big as that in the Santiago stock exchange. Still, total turnover remains below the world average for the 1990s. A second measure of efficiency is the ratio of stockbrokers’ gross profit over assets, a proxy of the cost of stock market participation. This indicator declined from around 5% in the mid 1980s to 2% on average in the mid 1990s, which indicates improving market efficiency over the last decade.

Another important component of the financial sector in Chile are pension fund managers (AFPs). AFP administrators invest the pension savings in a series of instruments, ranging from domestic public debt to foreign bonds. These agents have mobilized a gradually increasing amount of financial resources, with a strong positive effect on the development of other financial sectors and activities. By 2000, pension funds’ assets reached 40% of GDP. The composition by instrument

shows the importance of AFPs in affecting the availability of funds in the financial sector, as they own 40% of total public debt, 60% of total mortgage bonds, 50% of total corporate bonds in Chile, and 10% of the total stock of shares.

Regarding the pension funds' efficiency, their average return has been very high, around 10% on average since 1981¹⁵. However, the operational costs of the pension management companies have also been high in comparison with international standards, which may raise some doubts as to their efficiency (Valdés-Prieto, 1996 and 2000).

4.3 *Microeconomic Impact of Financial Reforms and Development*

The first issue concerns the firms' access to financial markets for investment purposes. Gallego and Loayza (2000) and Medina and Valdés (1998) focus on 79 medium-to-large size firms listed in the stock market.¹⁶ They study whether, as result of the financial development experienced in the 1990s, firms have become less dependent on their internal resources and balance-sheet composition to finance investment projects and more capable of raising funds in the financial market.

According to theory, in the absence of financial restrictions and corporate agency problems, firm investment depends exclusively on the value of the firm relative to its replacement value, adjusting for tax effects on capital adjustment costs (Tobin's q theory). To the extent that the firm faces constraints on external financing, its investment will be determined by its internal resources, namely, retained cash earnings. Furthermore, in the face of imperfect financial markets, the degree of leverage of the firm (i.e., the debt-to-capital ratio) may deter the availability of external financing even after controlling for Tobin's q . Therefore, a firm faces a better functioning financial system when, first, its investment is more responsive to changes in q ; second, investment is less determined

¹⁵ The average annual real return of pension accounts between July 1981 and December 2002 was 10.3%. This return has fallen sharply over time. For instance, the average real return between January 1997 and December 2002 was 5.55%. The return during 2002 was only 2.98%.

¹⁶ Both studies use the FECU database described in the appendix.

by the firm's cash flow; and, third, investment is less negatively affected by the firm's liability composition, represented by the debt-to-capital ratio.

The econometric results suggest that in general investment does not significantly depend on the firm's q-value but is driven positively by the firm's cash flow and negatively by its level of indebtedness. Accordingly, Chilean firms face important constraints on external finance. This conclusion, however, does not apply to AFP-grade firms¹⁷, which are significantly more responsive to changes in q and less dependent on cash flows. This result is to be expected given that AFP-grade firms are usually larger, better established, and enjoying the signaling derived from their investment-grade accreditation; thus, they are likely to face a more receptive financial environment than the average firm. Firms belonging to conglomerates (*grupos económicos*), on the other hand, are also different in that their investment rate is significantly less dependent on their debt-to-capital ratio, being more responsive to changes in the q-value of the firm and less restricted by internal resources, although these results are not statistically strong.

When considering the evolution of these restrictions in the 1980s and 1990s, these authors found that only after the reforms undertaken in the 1990s, investment in AFP-grade firms and conglomerate-members became largely driven by changes in market valuation, and was not tied to internal cash flows nor affected by debt-to-capital ratios. For the rest of the firms, the importance of internal resources and degree of leverage for investment decisions diminished in the 1990s, but cash flow remained relevant in their investment decisions while market q-value proved not significant.

This evidence is consistent with the results in Hsieh and Parker (2002). Using data from the Annual Census of Manufacturing (ENIA¹⁸), Hsieh and Parker study the role of the 1984 corporate tax reform that cut the tax rate on retained profits from nearly 50% to 10%. These reforms freed internal resources and allowed constrained firms to increase firm investment and growth. The estimated effects are larger in industries classified as heavily dependent on external finance. These results confirm the hypothesis that Chilean firms do face restrictions on external finance, and that

¹⁷ PFMC firms are those whose shares the private pension fund management companies are allowed to invest in (AFP investment grade, for short).

¹⁸ See appendix for a description of the ENIA database.

taxation on retained profits in countries with poorly developed financial markets reduces corporate saving, an important source of financing for profitable investment projects.

With regards to financial activity (measured either by the ratio of private credit to GDP or the stock market traded value relative to GDP), they conclude that these macro financial variables do not have an independent effect on investment once the q-value of the firm and the 1990s effect are accounted for. In other words, the effect on firm investment from macro financial development appears to work through microeconomic channels, that is, by making investment more responsive to the firm's q-value and less constrained on the use of external finance.

The second issue they study is how the liberalization and development of the financial sector affected the importance of debt relative to equity in the financing of firms. They found that a rise in the firm's size and an increase in its assets' tangibility appear to shift the financial structure of the firm towards higher equity and lower debt. Somewhat paradoxically, the firm's access to international equity markets appears to increase the debt-to-equity ratio of the firm. It is likely that the ability to issue ADRs has a positive signaling effect on the firm's creditworthiness. This effect might decrease the costs of indebtedness sufficiently to overcome the direct equity-promoting effect of issuing ADRs. In addition, periods in which the banking sector grew larger or was more active led firms to prefer debt over equity to finance investment. Conversely, whenever the stock market expanded, this induced firms to rely more in equity than debt.

Complementary evidence is found in Silva (2003). Using data from the FECUs, Silva studies the behavior of firm financing mix between bank and arm's length debt. She finds that larger and older firms tend to finance a larger share of its activities through public markets. She also finds that the signaling associated to stock-market listing gives firms a better access to bond finance. Finally, her results show that the reforms undertaken in the 1990s allowed firms to reduce their relative dependence on banks for project financing.

The third issue addressed is how the liberalization and development of the financial sector affected the importance of long-term debt relative to short-term debt in the balance sheet of firms. Gallego and Loayza (2000) found that asset profitability of the firm and the tangibility of its assets are positively associated with a longer maturity of the firm's debt. On the other hand, as firms get larger, their debt maturity becomes shorter. The access to international equity markets seems to lead to a larger share of long-term debt, possibly through the signaling mechanisms mentioned above.

Moreover, the total size of bank assets and the level of activity of private banking are not significantly related to a longer maturity of firms' debt. The size and activity of the total (public plus private) bond market, measured by its capitalization relative to GDP, is negatively related to the long-term to short-term debt ratio. However, when focusing only on the capitalization of the private bond market --arguably more directly related to the firms' financing choices than the public bond market--, the size of the private bond market induces firms to have a debt structure of longer maturity.

The fourth issue emerging from this research is how the liberalization and development of the financial sector affected the rate of growth of firms, measured by the proportional increase in its operational revenue. As expected, Gallego and Loayza (2000) obtain a significantly negative effect of the firm's initial size, revealing a convergence effect. That is, as the firm gets larger, its rate of growth slows down, *ceteris paribus*. Not surprisingly, the investment rate has a positive effect on the growth of firm's revenues. Financial firms do not appear to grow differently from the rest, whereas non-for-profit firms have a poorer growth performance even after controlling for the investment rate. The debt-to-equity ratio does not significantly affect firm's growth; this may suggest that if principal/agent considerations affect the growth of the firm, they do it through investment. Other variables that affect positively the rate of growth of the firms are the overall growth of the economy (GDP growth) and the level of activity of the banking sector. However, the size and activity of the stock market have a surprisingly negative effect on growth. The interpretation of this result would say that the development of the banking sector is more relevant than that of the stock market for the growth of the firm. However, when the stock market size abstracts from price effects, the result reverses, indicating that "quantity" measures of stock market capitalization have a positive and significant effect on firms' growth rate.

4.4 *The access of firms to the financial sector*

Although the development of the financial sector has gradually allowed firms to move away from banking finance towards bonds and stock markets, banks remain an important source of financing for firms, especially medium and small size firms. Hence, it is important to understand the way in which firms operate with banks.

Two aspects of the link between the financial sector and manufacturing firms has been studied by Repetto, Rodríguez and Valdés (2002) using the ENIA database and their corresponding portfolio of loans contracted with the domestic financial sector in the 1990-1998 period. First, they examine whether concentration of the banking industry influences the conditions at which a given firm obtains a loan. Second, they study whether the duration of bank-client relationships affects access to bank financing. They evaluate both the volume of bank lending (as a percentage of the firm's physical capital) and the interest rates that individual firms are charged.

From a theoretical point of view, both bank concentration and the length of the lender-borrower relationship have ambiguous impacts on the access to bank loans. With regards to bank concentration, several authors suggest that bank financing is less expensive than borrowing from public lenders, either because intermediaries can save on monitoring and agency costs (Diamond, 1984) or because increased competition among banks may lead to information dispersion (Marquez, 2000). On the other hand, while bank control can reduce costs and increase efficiency, market power by banks may result in monopoly pricing if competition and/or contestability are weak (Rajan, 1992). Furthermore, banks may build up an ex-post information monopoly that adversely affects lending. This hold-up problem can make it costly for a firm to switch lenders as it may signal that the bank with the information monopoly is not willing to lend to the firm. In this case, the bank can extract rents from the firm and possibly distort its investment decisions. Concentration, therefore, may produce borrower capture. As for lender-borrower relationships, it is straightforward to argue that a lengthier relationship produces a more durable connection that alleviates information asymmetries, thereby reducing financial costs. Long relationships, however, can be potentially costly for a borrower, if the stigma from cutting financing is higher the longer –and thus the more informed– is the relationship (Houston and James, 1996).

Most of the international empirical literature on financial market imperfections has focused on the consequences on investment of internal funds availability to conclude that borrower-lender information asymmetries are a key determinant of external funding access (Fazzari et al., 1988). Indeed, a number of articles have studied the effects of lender-borrower relationships on firm performance, i.e., on the value of the firm and investment decisions. Repetto et al (2002) analyze the direct effects of these market imperfections on bank lending, using Chilean data.

Table 12 describes the borrowing patterns of manufacturing firms in the ENIA sample. Firm size categories are based on employment quintiles, so the second entry represents the level of debt of the smallest 20% of firms. The average firm hires around 110 employees, sells almost US\$ 8 millions a year, holds a capital stock of around US\$ 3 millions, and earns profits of US\$ 2.7 millions. The average ratio of debt to capital stock is 2.14. Although the total amount borrowed increases with firm size, the ratio of debt to capital stock is similar for both the smallest and the largest firms. One possible explanation to this pattern is that smaller firms have a higher demand for funds, and that those small firms that do obtain loans get large amounts relative to their capital stocks. At the other end of the distribution, larger firms are offered more loans, and borrow more from banks despite their better ability to raise funds from different sources.

The table also reports measures of closeness of a firm to its creditors. On average, sample firms have a lending relationship with about 3 banks. The number of related banks strongly increases with firm size. The smallest 20% of firms relate, on average, to slightly less than two lenders, whereas the largest 20% of firms borrow on average from over 4 banks. A second measure of closeness to a bank is the concentration of borrowing. The firm-specific Herfindahl index was calculated using the shares of total firm debt borrowed from each of the banks that actually lend to the firm. This measure also shows that bank lending is highly concentrated, and that concentration decreases as the firm size increases. A third measure of firm-bank closeness is the length of the relationship, measured by the age of the oldest loan. On average, firms have been servicing loans for at least 5.5 years (or 5 years at the median). There is no clear relationship between the age of the oldest loan and the size of the firm.

Interest payments as a fraction of the average debt measures the actual cost of borrowing. On average, firms spend more funds on interest payments as they grow. The median interest rate is about 24%. Although the relationship between size and age is not monotonic, the cost of borrowing is lower for larger firms: the smallest firms pay rates that are four percentage points higher than the rate paid by the largest firms.

The econometric results of Repetto et al (2002) provide an interesting set of stylized facts on the access to bank loans of firms in the Chilean economy. First, larger firms have lower debt to capital ratios. Probably, as they grow larger, firms increase their reliance on arm's length financing

and not on the banking system, a result consistent with the evidence in Silva (2003)¹⁹. The estimation results indicate that if a firm hires 100 more employees, then the debt-capital ratio falls by 3.3 percentage points. Second, firms with larger sales also have lower debt to capital ratios. Third, more profitable firms tend to finance a larger fraction of their capital stock through bank loans. More profitable firms have perhaps better access to funds, even though they are in less need of them. If a bank is able to spot this profitability, it will probably be more interested in lending. These results are consistent with those in Gallego and Loayza (2000) and extend their conclusions to medium-and-small size firms that are typically not listed in the stock market.

The ability to identify individual firms allow Repetto et al. (2003) to conclude that older firms finance a smaller share of their capital stock with debt. The effect is significant for individuals and limited liability corporations, but not for publicly traded companies. Likewise, the length of the relationship between firms and the banking sector has a positive and significant effect on debt to capital ratios, i.e., firms that have been borrowing for a longer period are able to fund a larger fraction of their capital needs through the banking system. The magnitude is large, as each additional year represents about 4% of the median debt-capital ratio in the sample.

Finally, with regards to the way in which firms interact with banks, they found that concentration, as measured by the firm-specific Herfindahl index, has a large and negative effect on the amount borrowed. In addition, the number of banks from which firms borrow has a positive and large effect on loans. Moving from one to two relationships allows firms to increase their debt to capital ratios by 34.7 percentage points, and from two to three banks by 19.5 percentage points. Alternatively, borrowing and the number of lending banks may be mechanically related as more debt should naturally be supplied by more banks²⁰

The other key aspect of the relationship between banks and firms is the cost of borrowing. Repetto et al (2002) found that firms that have held lengthy relationships with banks obtain cheaper loans. The magnitude of the effect is quite large: each extra relationship year decreases loan rates by 65 basis points. Moreover, loan rates appear to be insensitive to the Herfindahl index, whereas

¹⁹ See the discussion in the previous subsection.

²⁰ However, preliminary results in García et al show (2003) that the effect of the number of relationships does not disappear if one corrects for the endogeneity of the number of lenders.

the number of related banks has a negative and significant effect on lending rates. In particular, each extra bank reduces the interest rate by almost 50 basis points (bp).

Although the amount of sales do not have a significant effect, larger firms –measured by its employment level– are charged lower rates. The estimated effect of 100 extra employees is of the order of 50 basis points less. Firms' profitability also has a negative and significant effect on the loan rates: for every 1% increase in the profits-sales ratio, loan rates fall 60-70 basis points. The sign of the age effect depends crucially on the ownership status of the firm. Firms owned by an individual are charged higher rates as the firm gets older, whereas limited liability companies and publicly traded corporations are charged cheaper rates over time.

Table 12.
Bank Borrowing by Firm Size in Manufacturing

	All firms	Firm size (sorted by employment)				
		Quintile I 10-23 empl.	Quintile II 24-38 empl.	Quintile III 39-66 empl.	Quintile IV 67-139 emp	Quintile V over 140 em
Average debt (in US\$ tho.)	213.6	23	36.4	66.7	154.1	792.4
Median debt (in US\$ tho.)	244.8	5.8	12.4	23.9	59.6	236.1
Average debt/capital ratio	2.1	2.8	2.4	1.5	1.7	2
Average number of firm-bank relationships	2.9	2	2.2	2.6	3.1	4.5
Concentration Index	0.7	0.8	0.7	0.7	0.1	0.6
Average loan age	5.5	5.6	5.5	5.5	5.5	5.7
Interest paid (in US\$ tho.)	60.6	12.2	28.8	61.6	135.3	552.7
Median Interest-Debt Ratio	0.24	0.25	0.25	0.26	0.24	0.21

Source: Repetto et al (2002).

The results in Repetto et al (2002) suggest a number of policy implications. In particular, they suggest that tax policy should avoid lock-in effects that make it difficult for firms to "shop around." More significantly, policy should foster multiple relationships. One source of lock-in

effects is the tax on credits (“timbres y estampillas”) that are imposed even when a borrower transfers a loan across banks. It is worth noting that starting in November 2002 this tax was phased out for a two year period for collateralized loans renewals. This is an anti-switching policy, as it reduces the cost of maintaining current relative to new relationships. The effect is to reduce the effective competition that banks face, and thus allowing them to exploit any informational monopoly they may have built in the past.

Another difficulty a typical firm faces for having multiple relationships is the indivisibility of collateral or guarantees. It has long been recognized in Chile that moving guarantees across banks is a difficult task. In fact, some people have proposed to centralize the administration of guarantees in order to facilitate bank shifts. The evidence in Repetto et al shows that this might not be enough. True competition needs firms to relate contemporaneously to more than one bank, and for that purpose firms need divisible collateral. The proposed central agency could provide that service.

Although our model does not allow for imperfect market competition and adverse selection and moral hazard problems, we can easily accommodate these distortions as a wedge between the rate on return on investment and the costs of funding that limit the extent to which firms can finance their projects. In terms of our model predictions, these financing constraints scramble the ordering of firms according to productivity, allowing inefficient firms to stay in the market and driving productive firms out of business. Furthermore, we can model these financing constraints as a cost to firm creation, reducing the overall rate of technology adoption. All these effects reduce the efficiency with which resources are allocated in the economy, and thus they translate into lower growth rates and reduced long-term welfare.

4.5 *Are small and medium size firms constrained in their access to the financial sector?*

The access of small and medium size firms (PYMEs) to investment financing is an important policy issue that has received substantial media coverage after the 1998 downturn. Surprisingly, there is little empirical analysis on the actual reality of PYMEs²¹. The general presumption is that

²¹ One major source of plant level information in Chile, the ENIA, does not cover firms with less than 10 employees, and hence does not provide information on very small firms.

PYMEs receive comparatively less financing from the financial sector and that their cost of borrowing is substantially higher as compared to large firms.

Cabrera et al. (2002) provide important insights on these two dimensions of the access of PYMEs to financial markets. First, they document that in fact PYMEs do not receive proportionally less credit than large firms. As presented in Table 1, the stock of credit allocated to PYMEs was around 30% of total credit, whereas another 10% was directed towards microenterprises. When scaled by sales -an indirect measure of their financial needs-, it becomes apparent that PYMEs actually do not seem to be constrained – in relative terms --in their access to credit: the ratio of their share in debt as a fraction of their share in sales is between 1.2 and 1.4, exceeding substantially that of large firms (0.8). This, naturally, may also reflect the fact that most large firms have access to foreign credit markets. Moreover, as the financial market developed and deepened, credit to small firms expanded much faster than credit to large firms in the late 1990s: between 1994 and 1998, it grew roughly 50% whereas that of large firms expanded by only 37%. Credit to medium size firms, on the other hand, grew at only 30%.

Additional support of the view of PYMEs as not being too constrained in their access to financing is the fact that as of September 2002, only 15 thousand PYMEs had rescheduled their debts under the support program of CORFO and for only US\$355 millions or 4% of the stock of debt at the beginning of the 1998 crisis (SBIF, 2002). In fact, a report of the IDB (2002) estimates that over 70% of PYMEs in Chile had access to financial credit in 2000, up from only 55% in 1991.

The second stylized fact described by Cabrera et al. (2002) relates to the cost of borrowing. It is true that smaller firms tend to pay higher interest rates on their credits. While this may reflect market power on the part of banks, it may also be the result of market conditions and the mechanics of financial intermediation. Cabrera et al. note that smaller firms tend to exit the market at higher rates than larger firms, i.e., they are riskier to banks because when they go out of business only a fraction of the credit is typically repaid. This is reflected in the higher proportion of overdue loans of PYMEs when compared to large firms, as presented in Table 13. This is also consistent with the results of Repetto et al (2002) that show that even after controlling for firm age, profitability and credit history – proxies of firm quality – smaller firms measured by their sales do not face higher borrowing costs. This would probably not be an important problem if the risk were diversifiable among the different customers of a bank. Unfortunately, most of the risk is tied to non diversifiable

fixed costs, such as the administrative costs of monitoring and determining the creditworthiness of different clients under severe information asymmetries.

The analysis of Cabrera et al (2002) is also consistent with the proposal of reducing the cost of bank switching and of the establishment of multiple firm-bank relationships. As discussed above, one source of switching costs is the tax charged on loans (timbres y estampillas). Another one is the difficulty that firms face in moving and dividing its collateral. Furthermore, small firms would benefit from the development of a credit scoring system, as gathering information may allow banks to better monitor and screen the quality of the projects they finance. Finally, Cabrera et al propose the complete elimination of interest rate controls. Small firms are riskier and hence should pay higher credit rates; i.e. there is no apparent market failure that would justify a credit subsidy towards small firms. Controls on the rates that banks can charge only limit the ability of banks to extend loans to these firms, exacerbating the extent of credit market constraints.

Table 13.
Distribution of Banking Credit, as of 1998

	Micro enterprises	Small firms	Medium size firms	Large size firms
Total debt (US\$ mn)	2,928	4,961	3,664	16,811
Share in total debt (1)	10.3	17.5	12.9	59.3
Share in total sales (2)	4.4	12.5	11.3	71.9
Ratio (1)/(2)	2.4	1.4	1.2	0.8
Debt growth 1994-1998 (%)	18.8	49.7	29.9	36.8
Overdue loans	3.5	2.8	1.9	1

Source: Cabrera et al. (2002)

4.6 *The response of firms to capital inflow controls*

Facing a surge in private capital inflows in the early 1990s, the authorities established capital controls in the form of a reserve requirement on short-term inflows. Minimum permanence requirements before repatriation of capital and profits were also implemented. The reserve requirement obliged capital importers to put a fraction of the inflow in a deposit bearing no interest

in the Central Bank. It thus constituted a tax on selective capital inflows, that introduced a wedge between domestic and foreign interest rates.²² Minimum permanence requirements may be interpreted as restrictions on both capital inflows and outflows. Technically, they affect outflows of capital because they restrict the repatriation of principal and cumulative profits accrued on past investments. However, in an ex-ante sense they deter additional foreign investment, and hence negatively affect (future) capital inflows.

Gallego and Hernández (2003) measure the effects of the capital controls on the way firms finance their operations and on their cost of capital in the 1986-2001 period.²³ They found that the lifting of restrictions on capital outflows increased the cost of funding for all firms. It is plausible that allowing Chilean investors (especially institutional investors such as pension funds) to invest abroad, may have increased the cost of borrowing for Chilean firms at the margin. In other words, keeping national savings ‘captive’ in the local market may have resulted in an artificially lower cost of borrowing for firms in our sample.

With regards to unremunerated reserve requirements (URR), at the aggregate level they affected the ways in which firms finance their operations as well as their cost of funding, although the magnitude of these effects was not very large. In particular, URR led to a reduction in leverage and in paid-capital, and an increase in the relative importance of retained earnings, effects that are fully consistent with a higher relative cost of borrowing v/s issuing equity. Similarly, at the aggregate level the URR raised the external cost of funding: firms were unable to fully avoid the effects of a raise in domestic interest rates by shifting to foreign sources of funds. Although statistically significant, the average effect on the external cost of funding was rather small.

These results, nevertheless, mask the heterogeneity of responses among firms in different economic sectors. Large firms, those belonging to a conglomerate and those able to issue securities (bonds or equity) abroad, responded to the URR by substituting paid-equity for debt: they reduced their leverage by increasing their capital base but without resorting to retained earnings. On the

²² This policy sought to enhance the effectiveness of monetary policy in the control of both domestic inflation and the size of the current account deficit, without necessarily forcing the central bank to give up exchange rate policy.

²³ They used the FECU database.

contrary, small and medium size firms and those in the services sector were unable to reduce their leverage, but reduced their capital base and resorted to retained earnings. Somewhere in between, firms in the tradable sector –comprising primary, manufacture and transportation– reduced their capital base and leverage by resorting to retained earnings.

Similarly, the response in the term-structure of debt differs significantly among sectors. For instance, firms belonging to economic conglomerates and those able to issue securities abroad were able to significantly reduce their reliance on short-term financial debt without changing their overall term structure of debt. On the contrary, small firms and those in the services sector increased their reliance on both short term and short-term financial debt. One possibility that explains this result is that small firms and those in the services sector are subject to credit rationing in normal times, and only had access to additional bank credit when other firms (prime borrowers) reduced their demand for funds from the banking sector.

In addition, large firms and those in the primary and manufacture sector shortened the maturity of debt without increasing the share of short-term financial debt in the total, while medium-size firms and those in the utilities and transportation sector did not shorten the maturity of debt and did not change the share of short-term financial debt in the total.

A similar conclusion can be drawn with regards to the cost of funding. The URR increased the cost of funding from abroad, but its impact was different across firms. In particular, it raised the cost of funding only for small firms and those in the manufacture sector, for those belonging to economic conglomerates, and for those that had access to international capital markets (and that issued equity and bonds). Other firms were able to avoid its effects either because of having low debt initially. Alternatively, since trade credit was exempted from the URR, some firms may have been able to obtain external funding from trade partners. In the case of large firms it is also plausible that they were able to reduce the effects of the URR by passing on the additional cost to suppliers (e.g., by delaying the payment of bills). This would be consistent with the behavior observed in Chile in 1998 in the height of the financial markets turmoil, when interest rates (and in other emerging market economies) reached extremely high levels. In this period, large firms arbitrarily extended the payment period to suppliers from 90 to 180 days, forcing smaller firms to assume the increase in the cost of funds. In sum, it can be claimed that the URR introduced a distortion that changed the funding patterns and costs of firms, but the effects were not uniform across firm groups.

5. Trade Reforms and Microeconomic Performance

In early 2003, Chile concluded negotiations with the European Union, the United States, and the Republic of Korea to implement free-trade agreements as early as 2004. These negotiations marked the culmination of 30 years of free trade policies and, when implemented, will consolidate Chile as one of the more open economies in the world.

Trade opening is usually a costly process. It means substantial reductions in sector protection, important changes in relative prices and massive relocation of resources among sectors. At the heart of this transformation is the process by which firms are forced to change production strategies, modernize technologies, acquire managerial skills that allow them to compete in international markets, close down unprofitable operations and develop new markets.

This section surveys our knowledge of how Chilean firms adapted to trade opening and presents the stylized facts that characterize the changes in productivity induced by foreign competition. The conclusions collected provide insights on the likely performance of the Chilean economy once trade agreements are implemented.

5.1 Trade reforms

The engine of the spectacular transformation of the Chilean economy in the 1980s and 1990s has undoubtedly been the trade liberalization program initiated in the mid 1970s.²⁴ The response of the economy, nevertheless, took some time to materialize:²⁵ an initial export boom in the late 1970s was followed by a protracted contraction during the debt crisis (1982-83). Only during the late 1980s and 1990s the Chilean economy fully reaped the benefits of the changes in economic incentives and productive structure introduced by trade reforms. Exports increased from US\$ 6.3 billion in 1985 to US\$ 18 billion in 2002 in real terms, implying an annual growth rate of 6.1%. By 2002, exports represented around 32% of GDP.

²⁴The Chilean economic transformation has been extensively documented by Sjaastad and Cortés (1981), Edwards and Cox-Edwards (1987), de la Cuadra and Hachette (1991), and Bosworth, Dornbusch and Labán (1994).

²⁵ See appendix Table 1 for selected macroeconomic indicators of the Chilean economy

The main reason for the radical transformation brought about by the trade reforms was the clear failure of the import-substitution strategy in providing the basis for sustained growth. The import substitution scheme, implemented in Chile since the 1940s, included high and very differentiated import tariffs (ranging from 0 for capital goods to 750 percent for luxury goods), quotas and import prohibitions, requirement of a 90-day non-interest bearing deposit of 10,000 percent of the CIF value of imported goods, and administrative approval of all import operations. In addition, a system of multiple exchange rates prevailed reaching, at the collapse of the economy in 1973, a proportion of 52 to 1 (Corbo and Fischer, 1994).

By the late 1960s, trade restrictions had practically isolated the Chilean economy from the rest of the world, exacerbating its dependence on copper exports and confining imports to intermediate and capital goods. The structure of relative prices was characterized by important distortions in favor of industrial goods at the expense of agricultural, mining and other tradable activities. Differential import duties exempted capital goods and levied high taxes on final goods, creating a largely inefficient capital-intensive industrial sector.²⁶

In the 15 years that followed the 1973 crisis, trade liberalization policies were to be the cornerstone of the transformation of the inward-oriented Chilean economy into a dynamic export-oriented country. The initial set of reforms, which included price liberalization, exchange market unification and the elimination of most non-tariff barriers (quotas and prohibitions), was designed primarily with the purpose of stabilizing inflation, eliminating black markets, and reducing speculation. The resistance of inflation to decrease, despite the substantial decline in the fiscal deficit, led the government to apply a drastic program of government austerity and monetary restraint in mid-1975, which effectively reduced inflation from 70% in the second quarter to less than 25% in the third. On the productive side, however, the stabilization effort, coupled with a severe downturn in terms of trade, induced a drastic recession: in 1975, GDP fell by 13.3% and unemployment rates sharply shot up to 17%.

During the 1976-80 period the economy recovered at high speed: GDP grew at an average

²⁶ Only one stabilization plan, in 1959, included wide-range trade liberalization measures. Expansionary government policies led to overvaluation of the exchange rate, a large increase in imports, and to an unsustainable current account deficit and balance of payments crisis in 1962. In turn, it prompted a large devaluation and a return to capital and trade controls (Velasco, 1994).

rate of 7%, the availability of foreign goods expanded markedly, and the government deficit turned into a surplus. In addition, an important number of reforms were initiated to complement and reinforce the change in relative prices induced by trade deregulation. Among them, a large number of public enterprises were privatized, labor markets were deregulated, social security was reformed, and health and public education responsibilities were transferred from the ministries to the county levels. Although reforms advanced in several fronts, two major problem remained unsolved: unemployment levels did not decline in a significant way, and inflation remained stubbornly high. Among the instruments used to control inflation, the fixing of the nominal exchange rate in June, 1979, proved to have a devastating effect. The highly indexed nature of the Chilean economy,²⁷ in combination with the fixed exchange rate, induced an increasing overvaluation in the real exchange rate, fostering imports and discouraging exports, and leading to large current account deficits.²⁸ In 1981, the latter reached 14.5% of GDP. Large amounts of foreign loans entered the country to finance the trade imbalance and, as a consequence, the foreign debt increased from US\$ 6 billions in 1977 to US\$14.8 billion in 1981. Two additional elements that help augmenting the level of indebtedness were the resistance of the real interest rate to converge to world levels, and the deregulation of the financial market in 1981. The former induced a continuous flow of short-term lending; the lack of adequate supervision of the quality of the portfolio of banks in the latter, led to a generalized miscalculation of risk levels and imprudent domestic lending.

With such a large trade imbalance, confidence in the Chilean economy faltered and foreign lending ceased. In June, 1982 the authorities were forced to devalue the peso by 19%, but "it was too little, and too late" (Edwards and Cox-Edwards, 1987). The economy fell in a deep recession as GDP dropped by 13.4% in 1982 and a further 3.5% in 1983; unemployment, already high, skyrocketed to reach 34% of the labor force (including emergency employment programs), and the government deficit increased to almost 9% of GDP when the Central Bank had to rescue the financial sector from bankruptcy. Foreign debt reached 130% of GDP in 1983.

During much of the 1983-84 period economic policy went adrift. Exchange controls were

²⁷ Indexation is a mechanism by which prices and wages are automatically adjusted by past inflation to maintain their real level constant.

²⁸ It has been estimated that by 1981 the exchange rate was overvalued by 21% (Elbadawi and Soto, 1994).

reintroduced, trade restrictions multiplied, and subsidies for financial and industrial firms were allocated on a very discretionary basis. Despite the military stronghold, political turmoil emerged. After expansive fiscal policies enacted in 1984 to cope the hardness of the recession increased inflation and the foreign trade alarmingly, the government returned to a market-based approach in early 1985, engineered a large real devaluation (30%) and embarked the economy firmly into its current export-oriented strategy. Tariffs and restrictions were scheduled to be shortly phased-out, tax incentives for exporters expanded, and government expenditures were reduced aiming at both fiscal austerity and exchange rate support.

After 1985, trade policy has focused on keeping import tariffs flat (i.e., equal for all goods and sectors) and reducing protection in a gradual manner from around 15% in 1988 to 6% in 2002. During the late 1990s, Chile signed several trade agreements with different countries (e.g., Mexico, Costa Rica, Colombia) that reduced tariffs even further, although at the potential cost of inducing higher effective protection for goods of different origin. In early 2003, Chile concluded negotiations and signed agreements with the European Union and the Republic of Korea to allow completely free trade as early as 2004. Negotiations with the United States also reached an agreement but free-trade acts are yet to be signed. This free trade agreement will reduce average tariffs to the tune of 4% when implemented. In addition, the government has committed to further reductions in the tariff level for trade with other countries.

5.2 *Trade Reforms and Sectoral Adjustments*

Trade reforms induced substantial changes in relative prices and affected Chilean industries in a markedly different ways. As protection declined, relative prices between traded non traded goods changed dramatically. Likewise, domestic producers faced competition with higher quality goods at similar relative prices. As a result, previously protected industries saw marked declines in real prices and dwindling demand for their products (e.g., import-substituting firms). On the contrary, exporters benefited from both access to international markets and cheaper imported inputs.

As already mentioned, significant changes in relative prices should have induced massive relocation of inputs among firms and industries. Navarro and Soto (2001) found that, consistent with trade reforms, input relocation was the key determinant of productivity gains and economic growth

in the 1979-1985 period. On the contrary, after 1986, that is when trade reform was completed, input relocation becomes less significant and productivity gains was determined by technical change.

Although sectoral adjustments provide indirect evidence on the impact of trade reforms, aggregate figures tend to mask the robust patterns of micro-level resource reallocation present in the Chilean economy after reforms (Roberts and Tybout, 1997). First, there is a vigorous process of entry and exit of plants, which in turn influences the dynamics in labor markets. The entry of new manufacturing plants and the growth of existing plants in each year create new employment positions that average between 19 percent of total manufacturing sector employment. At the same time the contraction and closing of other plants is responsible for the simultaneous loss of between 12 and 14 percent of total employment in each year. This high rate of employment reallocation among manufacturing plants is present in all the countries studied and persists in each year throughout the business cycle, reflecting a vigorous process of micro-level adjustment. Second, sectoral data ignores a wealth of information regarding the dynamics of productivity gains that lies behind the entry/exit process. On average, exiting plants are less productive than surviving ones and entering plants are less productive than more experienced incumbents. However, as new plants mature their average productivity tends to increase for several years until they reach industry norms. Overall, the empirical results reveal a continual process of resource reallocation that moves resources from less efficient to more efficient producers within the same industry and that contributes to long-run improvements in economic performance.

5.3 *Trade Reform and Microeconomic Behavior*

There are three channels through which trade reform may affect the performance of firms and, eventually, induce higher, sustained economic growth. First, opening the economy induce changes in relative prices –for both goods and factors– that lead to specialization and use of scale economies as a result of expanding markets. This, in turn, leads to TFP gains. Second, price realignment between consumption and capital goods may lead to higher saving and more readily available funding for investment. Third, more trade encourages technology adoption and better management practices, that in turn translates into higher efficiency (Alvarez and Fuentes, 2003).

Other effects on intra-firm productivity are more robust. Intra-firm productivity gains may

accompany trade liberalization if it expands the menu of intermediate inputs available to domestic firms. This allows each producer to match his or her input mix more precisely to the desired technology or product characteristics. Similar comments apply concerning access to capital goods, as de Long and Summers (1991) have stressed.

Trade may also act as a conduit for disembodied technology diffusion if firms learn about products by observing imported varieties, or by exporting to knowledgeable buyers who provide them with blueprints and give them technical assistance (e.g., Grossman and Helpman, 1991). Similar knowledge transfers may occur when domestic firms enter into joint ventures or sell equity to foreign multinationals, although these activities are less directly related to commercial policy.

Finally, domestic knowledge spillovers further confound the picture. If learning externalities are generated by experience producing a good, then changes in a country's product mix induced by commercial policy can change the rate at which domestic efficiency grows (e.g., Krugman, 1987; Young, 1991). Whether trade liberalization helps or hurts in this respect depends upon which productive processes generate the most positive externalities, and whether they expand or contract as protection is dismantled.

The linkages between trade reform and productivity gains in Chilean firms have been studied extensively. Comparing industrial census data before and after trade liberalization, Tybout, de Melo and Corbo (1991) find that efficiency gains were very modest between 1967 and 1979. Nevertheless, plants in sectors with relatively large declines in protection have shown a greater tendency toward employment reductions, and concurrently higher productivity gains.

Using a similar methodology but a longer period of time, Marshall (1992) finds that productivity increased between 1974 and 1979, and decreased between 1979 and 1986. The behavior of productivity seems to be strongly determined by the evolution of trade policy – tariff in particular – during the period under study. Fuentes (1995) uses growth accounting to study the evolution of productivity in the manufacturing sector. His findings show that the 1970s trade opening was followed by significant increases in all manufacturing sectors in both labor productivity and total factor productivity. Tybout (1991), using revenue per worker as a productivity measure, quantifies share-based gains for Chile (1979-1985), Colombia (1977-1987) and Morocco (1984-1987). He finds that market share reallocations contribute to productivity growth among tradable goods, but his data span periods of major macro shocks rather than major trade liberalization episodes so it is

difficult to argue that the gains are trade-induced. Pavcnik (2002), also using plant-level data on Chilean manufactures, and estimating total factor productivity directly, finds evidence of within plant productivity improvements that can be attributed to a liberalized trade policy, especially for the plants in the import-competing sector. She also finds that in several cases, aggregate productivity improvements stem from the reshuffling of resources from less to more efficient producers. However, she does not investigate the link between market share reallocations and foreign competition. Moreover, Tybout (1991), Liu (1993), Liu and Tybout (1996), and Pavcnik (2002) all find that exiting plants were substantially less productive than surviving plants in Chile (and elsewhere), but none of these studies links this gap to import competition or exporting opportunities. In terms of our theory in Section 2, as firms are forced to compete due to the higher exposure to international trade, the economy's cut-off level of productivity moves to the right in Figure 2, inducing lower productivity firms to exit the market and new more efficient firms to enter. Consequently, a process of technology adoption is enhanced and aggregate productivity increases.

In summary, international trade undoubtedly played a key role in Chile inducing higher efficiency. The total effect on productivity, however, is fully observed with a lag. The removal of distortions affect the productivity path over time. Initially, as inputs factors reallocate from less to more efficient firms, efficiency rapidly increases. Later, however, a potentially more important effect shows up in aggregates: as new firms enter the market and more efficient technologies are adopted, the aggregate production possibilities frontier expand and the lag between the economy and the world leading edge technology is reduced.

6. Summary and Main Conclusions

Chile registered remarkable economic growth between 1985 and 1998, when the country's growth rate was in the top four worldwide. As a result, unemployment declined, wages rose, and poverty diminished. Although external conditions contributed to improve growth, the main source of sustained growth was a remarkable increase in total factor productivity.

The link between economic reforms and sustained growth at the macroeconomic level has been widely studied. The outstanding response of the economy to reforms at the macroeconomic level reflects, naturally, substantial changes in the industrial organization of domestic markets, as

well as the process of adaptation of individual firms to a new and more dynamic market environment. The underlying mechanics of technology adoption and changes in the management of firms have not been explored systematically until recently.

This paper, using Chilean manufacturing data, provides evidence on the interaction of firms and sectors with its macroeconomic environment. We develop a model with heterogeneous plants facing idiosyncratic productivity shocks to discuss the role of policies and reforms in affecting the decision of entrepreneurs to enter or leave a market and to adopt new, more efficient technologies.

Economic reforms in the 1980s and 1990s, mainly market liberalization and increase private sector participation, enhanced labor effort and capital utilization, allowed for the relocation of inputs from less efficient to more efficient firms, and induced technical adoption.

Plant entry and exit produce substantial creation and destruction of labor. Firms that exit the market destroy labor at rather high rates; nevertheless, firm entry created employment at similarly higher rate, not very different from those observed in OECD countries.

Another striking similarity with OECD countries is the presence of large and persistent differences in factor input usage and output across sectors and firms. We found that for high levels of disaggregation and even within the same sector and period of time, plants accumulate and destroy jobs and capital at a highly different pace. We provide evidence that idiosyncratic productivity shocks are a quantitatively relevant source of the observed heterogeneity in plant behavior. Productivity levels are actually quite heterogeneous within sectors and across periods of time. Differences among firms increase in periods of expansion –such as 1991-99– which is consistent with the entry of new firms that are more productive. Finally, our estimates of productivity are consistent with the theoretical priors as, on average, bigger, older, and more outward oriented plants have higher productivity levels.

Reforms undertaken during the 1970s and 1980s in Chile provided the conditions for relative prices to be market determined and allowed inputs to be efficiently allocated. We focus our analysis on the two most important reforms and their effects on plant dynamics: the deregulation and deepening of the financial sector and the liberalization of foreign trade. We derive several lessons about the response of firms to changes in macroeconomic conditions and, more importantly, we collect insights on the need for further reforms that would enhance the performance of the Chilean firms.

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Annex I: Databases

ENIA Dataset

The data set is the Encuesta Nacional Industrial Anual or ENIA, a survey of manufacturing firms conducted annually by the statistics government agency (Instituto Nacional de Estadísticas, INE). The ENIA covers all manufacturing plants that employ at least ten individuals. Thus, it includes all newly created and continuing plants with ten or more employees, and it excludes plants that ceased activities or reduced their hiring below the survey's threshold. The ENIA covers about 50% of total manufacturing employment. It collects detailed information on plant characteristics, such as manufacturing subsector (at the 4 digit ISIC level), ownership status, sales, employment, location, investment, and interest payments including inflation adjustments and bank commissions paid.

FECU database.

The sample consists of 79 firms that are quoted at the stock market and for which annual balance-sheet data for the period 1985-95 are available and complete. Balance-sheet data are obtained from the Ficha Estadística Codificada Uniforme (FECU), which is a mandatory report submitted by corporations to the corresponding government supervisory board. The FECUs contain firms' balance sheet data on a comparable basis for the 1985-95 period. Market value data are obtained from the Reseña de la Bolsa de Comercio de Santiago (RCBS), which is the annual report of the Santiago Stock Exchange.

Annex II: Main Macroeconomic Indicators of the Chilean Economy, 1975-2002

	Real GDP billions \$ 1990	GDP growth (%)	Curr. Acc. Deficit (% of GDP)	Exports (% of GDP)	2002 US\$	Terms of Trade	Nominal Tariffs Average (%)
1975	2,382,334	-	5.2	25.5	5,317	93.1	49
1976	2,464,450	3.4	-1.7	25.1	6,690	102.3	36
1977	2,709,280	9.9	3.7	20.6	6,502	92.6	22
1978	2,931,910	8.2	5.2	20.6	6,409	89.1	15
1979	3,172,175	8.2	5.4	23.3	9,326	105.5	10
1980	3,421,750	7.9	7.1	22.8	10,519	99.1	10
1981	3,616,965	5.7	14.5	16.4	7,820	88.3	10
1982	3,117,343	-13.8	9.2	19.4	7,124	78.7	10
1983	3,080,315	-1.2	5.4	24.0	6,912	85.7	18
1984	3,275,633	6.3	10.7	24.3	6,320	79.5	24
1985	3,265,790	-0.3	8.3	28.1	6,360	76.1	26
1986	3,419,179	4.7	6.9	29.1	6,892	73.6	20
1987	3,644,681	6.6	4.3	30.3	8,272	84.6	20
1988	3,911,154	7.3	0.7	34.6	10,724	114.6	15
1989	4,324,179	10.6	3.1	35.1	11,720	116.3	15
1990	4,484,071	3.7	2.8	34.3	11,524	102.0	15
1991	4,841,446	8.0	-0.2	33.3	11,810	94.7	11
1992	5,435,881	12.3	1.7	30.8	12,832	93.9	11
1993	5,815,647	7.0	5.7	27.8	11,452	92.7	11.0
1994	6,147,610	5.7	3.1	27.4	14,086	105.1	11
1995	6,800,952	10.6	2.1	30.6	18,916	116.1	11
1996	7,305,140	7.4	5.1	27.3	19,064	101.6	11
1997	7,858,481	7.6	5	28.5	20,030	104.7	11
1998	8,112,379	3.2	5.7	29.0	18,015	92.9	11
1999	8,050,656	-0.8	0.1	31.4	18,532	88.8	10
2000	8,386,157	4.2	1.4	31.7	20,069	90.6	9
2001	8,643,226	3.1		32.7	18,758	102.0	8
2002	8,828,644	2.1	0.9	32.4	18,340	93.0	7

Source: Central Bank of Chile database.